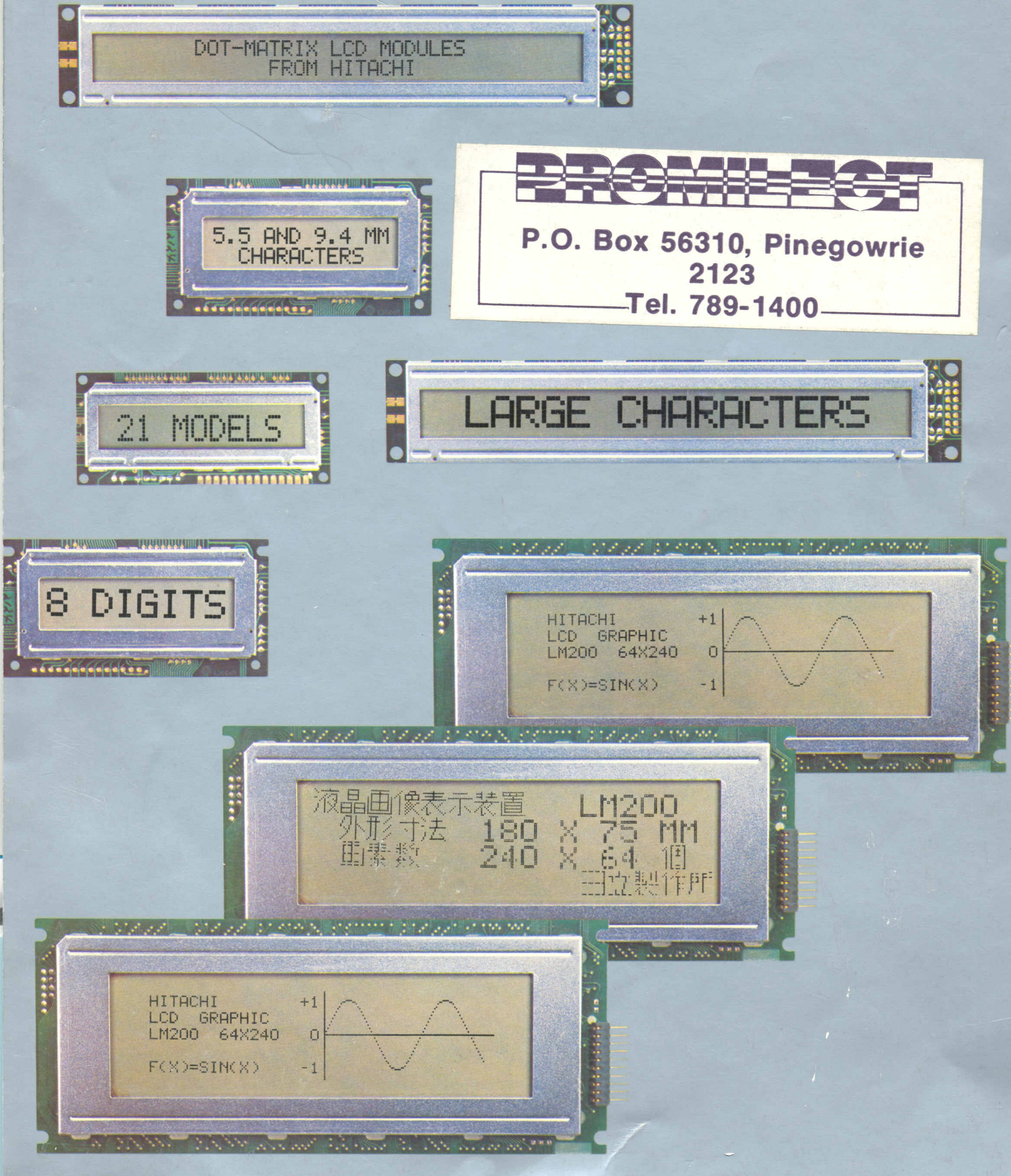
HITACHI DOT MATRIX LCD MODULES

HITACHI


DOT-MATRIX LCD MODULES
FROM HITACHI
5.5 AND 9.4 MM
CHARACTERS
21 MODELS
LARGE CHARACTERS
8 DIGITS
HITACHI
LCD GRAPHIC
LM200 64X240
F(X)=SIN(X)
+1
0
-1
液晶画像表示装置 LM200
外形寸法 180 X 75 MM
画素数 240 X 64 個
日立製作所

PROMILECT
P.O. Box 56310, Pinegowrie
2123
Tel. 789-1400

PREFACE

Hitachi Dot Matrix Liquid Crystal Display (LCD) Module was developed to display numerals, alphabet, symbols, graphics, etc.
The twist-nematic type liquid crystal, with a high contrast ratio was used. Due to its small size, light weight, low voltage, low power consumption, easy handling, etc., the Hitachi Dot Matrix LCD Module has been widely used as a display component for portable data terminal equipment, word processors and high class electronic tabletop calculators in Japan and abroad.
This brochure describes the electrical and optical characteristics, external dimensions and precautions in handling the 21 standard type of products, and it can be used when selecting equipment.

Note: The information contained herein is tentative and may be changed without prior notices. It is therefore advisable to contact Hitachi before processing with the design of equipment in corporating this product.

CONTENTS

PREFACE 2
FEATURES 4
APPLICATIONS 4
TABULATED DATA FOR HITACHI DOT MATRIX LIQUID CRYSTAL DISPLAY MODULE 4
OPTICAL DATA 6
HANDLING PRECAUTIONS 6
CONTROL LSI HD43160 A 7
CONTROL LSI HD44780 (LCD-II) 7

1. CONTROL LSI ATTACHMENT TYPE LCD MODULE
H2532A 12
H2535 14
H2538A 16
H2539 18
H2555 21
H2568 23

2. BUILT-IN CONTROL LSI TYPE LCD MODULE
H2570 26
LM015 28
LM027 31
H2571 34
H2572 37
LM016 40
LM032 43
LM017 46
LM018 49
LM041 52

3. GRAPHIC LCD MODULE
HD61380 55
H2525 56
LM200 59
LM021 62

4. LARGE CHARACTER LCD MODULE
LM054 65
LM038 68

5. INDUSTRIAL LCD's 71

6. MICROPROCESSORS FOR LCD MODULES 73

FEATURES:

1. By the combination of dots, numerals, alphabets, symbols, graphics, etc. can be displayed.

2. Due to the twist-nematic type liquid crystal, bright and high-contrast displays can be obtained.

3. Due to low drive voltage and low power consumption, this LCD module may be operated by battery.

4. An LSI is loaded exclusively for the LCD element drive. Also, a type containing a control LSI is available.

5. Due to its small size and light weight, compact display equipment can be constructed.

6. Various types are available, from small-sized modules for character display, to large-sized display module for graphics.

APPLICATIONS:

- Portable data terminal equipment
- Word processor
- High class electronic tabletop calculator
- POS terminal equipment
- Measuring instruments
- Other display devices

TABULATED DATA FOR DOT MATRIX LCD MODULES

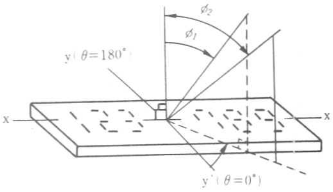
Type No.	No. of display character	External dimension W x H x T (mm)	Effective viewing area W X H (mm)	Character dimension W X H (mm)	Driving method Duty-Bias	Recommended power supply	
						V_{DD} - V_{SS} (V)	V_{EE} - V_{SS} (V)
H2532A	16 x 1 line	84.0 x 44.0 x 15 max.	61 x 15.8	2.9 x 5.5	1/8D - 1/4B	+5	−5
H2535	16 x 2 lines	84.00 x 44.0 x 15 max.	61 x 15.8	2.9 x 4.1	1/16D - 1/5B	+5	−5
H2538A	40 x 1 line	220.0 x 50.0 x 15 max.	163 x 17	3.15 x 5.5	1/8D - 1/4B	+5	−5
H2539	40 x 2 lines	220.0 x 50.0 x 15 max.	163 x 17	3.15 x 4.45	1/16D - 1/5B	+5	−5
H2555	40 x 1 line	227.0 x 38.5 x 15 max.	160 x 17	3.15 x 5.5	1/8D - 1/4B	+5	−5
H2568	40 x 1 line	227.0 x 38.5 x 15 max.	163 x 17	3.15 x 7.9	1/12D - 1/4B	+5	−5
H2570	16 x 1 line	80.0 x 36.0 x 12 max.	64.5 x 13.8	3.15 x 7.9	1/11D - 1/4B	+5	–
LM015	16 x 1 line	80.0 x 36.0 x 12 max.	64.5 x 13.8	3.15 x 5.5	1/8D - 1/4B	+5	–
LM027	24 x 1 line	126.0 x 36.0 x 12 max.	100.0 x 13.8	3.15 x 7.9	1/11D - 1/4B	+5	–
H2571	32 x 1 line	174.5 x 31.0 x 13.4 max.	132.5 x 14	3.15 x 7.9	1/11D - 1/4B	+5	–
H2572	40 x 1 line	182.0 x 33.5 x 13 max.	154.4 x 15.8	3.15 x 7.9	1/11D - 1/4B	+5	–
LM016	16 x 2 lines	84.0 x 44.0 x 15 max.	61 x 15.8	2.95 x 4.85	1/16D - 1/5B	+5	−5
LM032	20 x 2 lines	116.0 x 37.0 x 13 max.	83 x 18.6	3.2 x 4.85	1/16D - 1/5B	+5	−5
LM017	32 x 2 lines	174.5 x 31.0 x 13.4 max.	141.19 x 16.75	3.45 x 4.85	1/16D - 1/5B	+5	−5
LM018	40 x 2 lines	182.0 x 33.5 x 13 max.	154.4 x 15.8	3.2 x 4.85	1/16D - 1/5B	+5	−5
LM041	16 x 4 lines	87.0 x 60.0 x 14 max.	61.8 x 25.2	2.95 x 4.15	1/16D - 1/5B	+5	−5
LM054	8 x 1 line	84.0 x 44.0 x 15 max.	61 x 15.8	6.7 x 9.4	1/8D - 1/4B	+5	–
LM038	20 x 1 line	182 x 33.5 x 13 max.	154.4 x 15.8	6.7 x 9.4	1/8D - 1/4B	+5	–
H2525	20 dot x 239 dot	220.0 x 53.0 x 15 max.	163 x 17	Graphic	1/20D - 1/5.5B	+5	−5
LM200	64 dot x 240 dot	180.0 x 75.0 x 15 max.	132 x 39	Graphic	1/32D - 1/6.7B	+5	−5
LM021	24 dot x 479 dot	290.0 x 60.0 x 13 max.	245 x 19	Graphic	1/24D - 1/6B	+5	−5

Power consumption typ. (mW)	Operating temperature (°C)	Storage temperature (°C)	Weight (g)	LSI for LCD driving (Built-in)	Recommend. control LSI	Remarks	Page
10	0 ~ +50	−20 ~ + 60	40	HD44100	HD43160A		12
10	0 ~ +50	−20 ~ +60	40				14
10	0 ~ +50	−20 ~ +60	100				16
10	0 ~ +50	−20 ~ +60	100				18
10	0 ~ +50	−20 ~ +60	100				21
10	0 ~ +50	−20 ~ +60	100				32
10	0 ~ +50	−20 ~ +70	25	HD44780 and HD44100	Built-in	Single power supply	26
10	0 ~ +50	−20 ~ +70	25				28
10	0 ~ +50	−20 ~ +70	40				31
10	0 ~ +50	−20 ~ +70	60				34
10	0 ~ +50	−20 ~ +70	65				37
15	0 ~ +50	−20 ~ +70	25				40
15	0 ~ +50	−20 ~ +70	50				43
15	0 ~ +50	−20 ~ +70	60				46
15	0 ~ +50	−20 ~ +70	65				49
15	0 ~ +50	−20 ~ +70	60	HD44780/104			52
10	0 ~ +50	−20 ~ +70	25	HD44780		Single power supply	65
15	0 ~ +50	−20 ~ +70	65	HD44780/100			68
10	0 ~ +50	−20 ~ +60	100		HD61830	Full dot type	56
20	0 ~ +50	−20 ~ +60	150				59
20	0 ~ +50	−20 ~ +60	150	HD44100			62

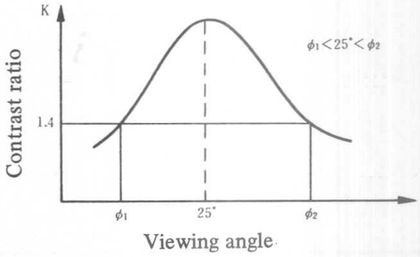
OPTICAL DATA

Item	Symbol	Condition	min.	typ.	max.	Unit	Note
Viewing area	$\phi2-\phi1$	K=1.4	20	—	—	deg.	1,2,8
Contrast ratio	K	$\phi=25°$ $\theta=0°$	—	3	—	—	3
Response time (rise)	t_r	$\phi=25°$ $\theta=0°$	—	200	400	ms	4,5
				250	400		4,6
				150	250		4,7
Response time (fall)	t_f	$\phi=25°$ $\theta=0°$	—	200	400	ms	4,5
				250	400		4,6
				150	250		4,7

Note 1. Definition of θ and ϕ

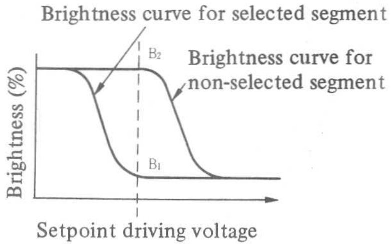


Note 2. Definition of viewing angle $\phi1$, and $\phi2$

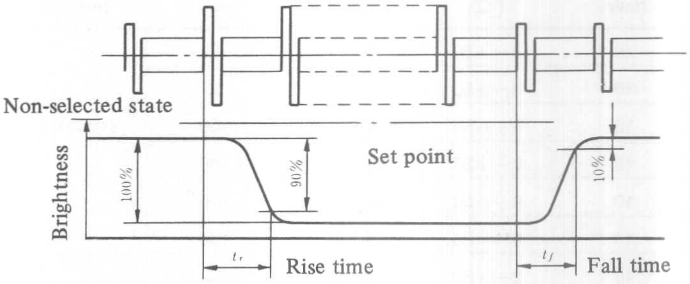


Note 3. Definition of contrast "K"

$$K = \frac{\text{Brightness of non-selected segment } (B_2)}{\text{Brightness of selected segment } (B_1)}$$



Note 4. Definition of optical response



Note 5. Applied type: H2532A · H2535 · H2538A · H2555 · H2568

Note 6. Applied type: H2539 · H2570 · LM015 · LM027 · H2571 · H2572 · LM016 · LM032 · LM017 · LM018· LM041· LM 054 · LM 038

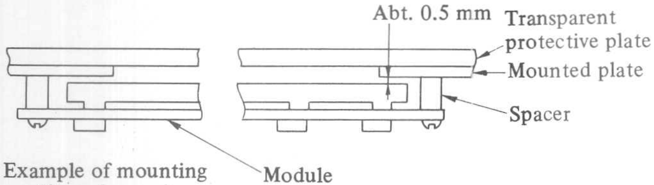
Note 7. Applied type: H2525 · LM200 · LM021

Note 8. Viewing area of LM200: typical 20deg.

HANDLING PRECAUTIONS

PACKAGE

1. If the display surface is dirty, wipe lightly with degreased cotton or chamois and benzine.
2. The glass may be broken or cracked. Special care should be taken when handling.
3. The polarization plate can be easily damaged. Glasses and tweezers must not be set.



Example of mounting
(for reference)

STRUCTURE

1. As shown in the figure, the module is fixed by using the PC board setting holes. When mounting, special care should be given to the following points:
   (1) For protection of the polarization plate and the liquid crystal cell, the protection plate made of acryl, etc. should be installed.
   (2) Installation should be performed with a clearance of 0.5 mm between the module and the setting plate to prevent module cover damage. When camber or twist force is great, the liquid crystal cell will be under stress, hence the spacer height tolerance should be ±0.1 mm.

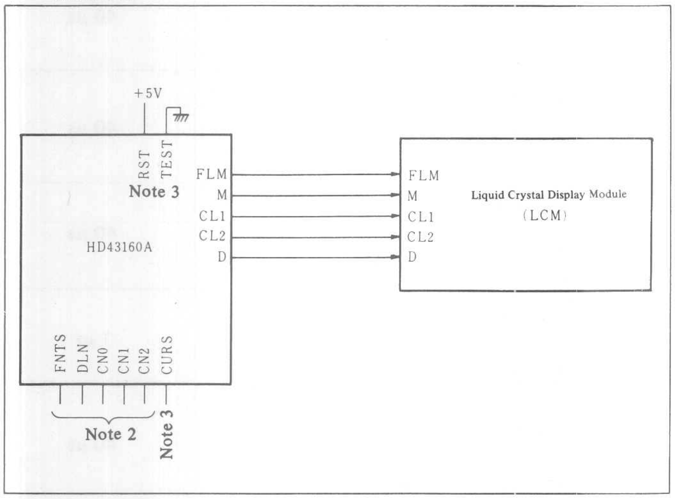
2. As this module is provided with C-MOS LSI, the care to take such a precaution as to grounding the operator's body is required when handling it.

OPERATION CAUTIONS

1. If the liquid crystal drive voltage (Vo) exceeds the designation, its service life will be shortened, consequently the module should be used within the designated range.
2. When DC voltage is applied, electrical and chemical reactions are generated which will shorten the service life; so when an M signal is input from the outside, the duty must be 50 ±1%. (For the M signal, refer to the interface timing chart of each type.)
3. If the operation temperature is lower than designated, the ON/OFF operation becomes slower. If the temperature is higher than designated, the display color becomes blue-black. However, when the temperature returns normal, the display also returns normal.
4. The liquid crystal drive voltage (Vo) should be adjusted to obtain an optimal contrast.

CONTROL LSI HD43160A

1. The HD43160A is a CMOS LSI developed to control the LCD module described below, and contains a character generator and character data memory.
   Applied type: H2532A, H2535, H2538A, H2539, H2555, and H2568.
   Example of a connection between HD43160A and LCD module.



2. For details, refer to "HITACHI DOT MATRIX LIQUID CRYSTAL DISPLAY CONTROLLER IC HD43160".

Note 1: When CURS = "1", the cursor has a 5 x 1 dot constitution. (■■■■■)
When CURS = "0", the cursor has a 1 x 1 dot constitution. (□□■□□)

Note 2: Treatment examples for all types are shown in the table below.

0: GND
1: V_{DD} (+5V)

Terminal / Type No.	FNTS	DLN	CN0	CN1	CN2
H2532A	0	0	0	1	0
H2535	0	1	0	0	1
H2538A	0	0	1	0	1
H2539	0	1	1	1	1
H2555	0	0	1	0	1
H2568	1	0	1	0	1

Note 3: The test terminal is fixed at the "0" level.
The RST terminal is normally at the "1" level.
When set at the "0" level, oscillation is stopped and DC voltage is loaded to the liquid crystal.

CONTROL LSI HD44780 (LCD-II)

The control LSI HD44780 is contained in the following LCD modules. The LCD modules below are compact and easy to use.
Several instructions can be found on page 8, and a comparison of the character code and the character pattern is shown on page 9.

1. LCD modules containing the control LSI HD44780
   H2570, H2571, H2572, LM015, LM027, LM016, LM032, LM017, LM018, LM041, LM054, LM038.

For details, refer to "HITACHI MICROCOMPUTER SYSTEM: DOT MATRIX LIQUID CRYSTAL DISPLAY CONTROLLER & DRIVER LCD-II (HD44780) USER'S MANUAL".

INSTRUCTIONS

Applied type: H2570, H2571, H2572, LM015, LM027, LM016, LM032, LM017, LM018, LM041, LM054, LM038

Instruction	Code										Description	Execution time (when fosc is 250 KHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear display	0	0	0	0	0	0	0	0	0	1	Clears all display and returns the cursor to the home position (Address 0).	82 µs~1.64 ms
Return home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position (Address 0). Also returns the display being shifted to the original position. DD RAM contents remain unchanged.	40 µs~1.6 ms
Entry mode set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and specifies or not to shift the display. These operations are performed during data write and read.	40 µs
Display ON/OFF control	0	0	0	0	0	0	1	D	C	B	Sets ON/OFF of all display (D), cursor ON/OFF (C), and blink of cursor position character (B).	40 µs
Cursor and display shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing DD RAM contents	40 µs
Function set	0	0	0	0	1	DL	N	F	*	*	Sets interface data length (DL) number of display lines (L) and character font (F).	40 µs
Set CG RAM address.	0	0	0	1	A_{CG}						Sets the CG RAM address. CG RAM data is sent and received after this setting.	40 µs
Set DD RAM address	0	0	1	A_{DD}							Sets the DD RAM address. DD RAM data is sent and received after this setting.	40 µs
Read busy flag & address	0	1	BF	AC							Reads Busy flag (BF) indicating internal operation is being performed and reads address counter contents.	1 µs
Write data to CG or DD RAM	1	0	Write Data								Writes data into DD RAM or CG RAM.	40 µs
Read data to CG or DD RAM	1	1	Read Data								Reads data from DD RAM or CG RAM.	40 µs
	I/D = 1: Increment I/D = 0: Decrement S = 1: Accompanies display shift. S/C = 1: Display shift S/C = 0: Cursor move R/L = 1: Shift to the right. R/L = 0: Shift to the left. DL = 1: 8 bits DL = 0: 4 bits N = 1: 2 lines N = 0: 1 line F = 1: 5 x 10 dots F = 0: 5 x 7 dots BF = 1: Internally operating BF = 0: Can accept instruction										DD RAM: Display data RAM CG RAM: Character generator RAM A_{CG} CG RAM address A_{DD}: DD RAM address Corresponds to cursor address. AC: Address counter used for both of DD and CG RAM address.	Execution time changes when frequency changes. (Example) When fosc is 270 KHz: $40\,\mu s \times \frac{250}{270} = 37\mu s$

* Don't care

For details, refer to "HITACHI MICROCOMPUTER SYSTEM: DOT MATRIX LIQUID CRYSTAL DISPLAY CONTROLLER & DRIVER LCD-II (HD44780) USER'S MANUAL".

FONT TABLE

1. Applied type: H2570, H2571, H2572, LM027.

Lower 4bit \ Higher 4bit	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
××××0000	CG RAM (1)		0	@	P	`	p		ー	タ	ミ	α	p
××××0001	(2)	!	1	A	Q	a	q	。	ア	チ	ム	ä	q
××××0010	(3)	"	2	B	R	b	r	「	イ	ツ	メ	β	θ
××××0011	(4)	#	3	C	S	c	s	」	ウ	テ	モ	ε	∞
××××0100	(5)	$	4	D	T	d	t	、	エ	ト	ヤ	μ	Ω
××××0101	(6)	%	5	E	U	e	u	・	オ	ナ	ユ	σ	ü
××××0110	(7)	&	6	F	V	f	v	ヲ	カ	ニ	ヨ	ρ	Σ
××××0111	(8)	'	7	G	W	g	w	ァ	キ	ヌ	ラ	g	π
××××1000	(1)	(	8	H	X	h	x	ィ	ク	ネ	リ	√	$\bar{x}$
××××1001	(2)	)	9	I	Y	i	y	ゥ	ケ	ノ	ル	$^{-1}$	y
××××1010	(3)	*	:	J	Z	j	z	ェ	コ	ハ	レ	j	千
××××1011	(4)	+	;	K	[	k	{	ォ	サ	ヒ	ロ	^{x}	万
××××1100	(5)	,	<	L	¥	l	|	ャ	シ	フ	ワ	¢	円
××××1101	(6)	-	=	M	]	m	}	ュ	ス	ヘ	ン	£	÷
××××1110	(7)	.	>	N	^	n	→	ョ	セ	ホ	゛	ñ	
××××1111	(8)	/	?	O	_	o	←	ッ	ソ	マ	゜	ö	█

Note: CGRAM is a CHARACTER GENERATOR RAM having a storage function of character pattern which enable to change freely by users program.

2. Applied type: LM015, LM016, LM032, LM017, LM018, LM041, LM054, LM038.

Higher 4bit / Lower 4bit	0000	0010	0011	0100	0101	0110	0111	1010	1011	1100	1101	1110	1111
xxxx0000	CG RAM (1)		0	@	P	`	p		ー	タ	ミ	α	p
xxxx0001	(2)	!	1	A	Q	a	q	。	ア	チ	ム	ä	q
xxxx0010	(3)	"	2	B	R	b	r	「	イ	ツ	メ	β	θ
xxxx0011	(4)	#	3	C	S	c	s	」	ウ	テ	モ	ε	∞
xxxx0100	(5)	$	4	D	T	d	t	、	エ	ト	ヤ	μ	Ω
xxxx0101	(6)	%	5	E	U	e	u	・	オ	ナ	ユ	σ	ü
xxxx0110	(7)	&	6	F	V	f	v	ヲ	カ	ニ	ヨ	ρ	Σ
xxxx0111	(8)	'	7	G	W	g	w	ァ	キ	ヌ	ラ	g	π
xxxx1000	(1)	(	8	H	X	h	x	ィ	ク	ネ	リ	√	x̄
xxxx1001	(2)	)	9	I	Y	i	y	ゥ	ケ	ノ	ル	⁻¹	y
xxxx1010	(3)	*	:	J	Z	j	z	ェ	コ	ハ	レ	j	千
xxxx1011	(4)	+	;	K	[	k	{	ォ	サ	ヒ	ロ	ˣ	万
xxxx1100	(5)	,	<	L	¥	l	|	ャ	シ	フ	ワ	¢	円
xxxx1101	(6)	-	=	M	]	m	}	ュ	ス	ヘ	ン	£	÷
xxxx1110	(7)	.	>	N	^	n	→	ョ	セ	ホ	゛	ñ	
xxxx1111	(8)	/	?	O	_	o	←	ッ	ソ	マ	゜	ö	█

Note: CGRAM is a CHARACTER GENERATOR RAM having a storage function of character pattern which enable to change freely by users program.

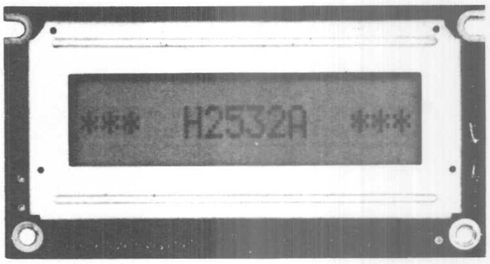
CONTROL LSI ATTACHMENT TYPE LCD MODULE

This module consists of LCD driver, drive LSI, PC board, and other parts.
By attaching the control LSI HD43160A, numerals, alphabets, Kana, and symbols can be displayed.

H2532A · H2535 · H2538A · H2539 · H2555 · H2568

H2532A

- 16-Position alpha-numeric display
- Control LSI HD43160A attachment type (see page 7)



MECHANICAL DATA (nominal dimensions)

Module size	84W x 44H x 15D (max) mm
Effective display area	61W x 15.8H mm
Character size (5x7 dots)	2.9W x 5.5H mm
Pitch	3.6 mm
Dot size	0.5W x 0.7H mm
Weight	about 40 g

ABSOLUTE MAXIMUM RATINGS

Supply voltage ($V_{DD}-V_{SS}$)	7 V max.
($V_{DD}-V_{EE}$)	13.5 V max.
Input voltage (CL1, CL2, D, M, FLM)	$V_{SS} \leqq V_{IN} \leqq V_{DD}$
Operating temperature (Ta)	0 to 50°C
Storage temperature (Tstg)	–20 to 60°C

ELECTRICAL CHARACTERISTICS

Power supplies ($V_{DD}-V_{SS}$)	+5 ±0.25V
Power supplies ($V_{EE}-V_{SS}$)	–5 ±0.5 V
Current consumption +5V	1 mA max.
–5V	1 mA max.
Input high voltage	0.7 V_{DD} min.
Input low voltage	0.3 V_{DD} max.
Power supply for LCD drive (Recommended) (V_O-V_{EE})	
at Ta = 0°C	5.3 V typ.
at Ta = 25°C	4.5 V typ.
at Ta = 50°C	3.7 V typ.

OPTICAL DATA

OPTICAL DATA	See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D	H/L	Serial row data of each character.
5	CL2	H→L	Clock signal for shifting the serial data.
6	V_{DD}	–	Power supply for logic circuit.
7	V_{SS}	–	Ground.
8	V_{EE}	–	Power supply for LC driving.
9	V_O	–	Operating voltage for LC driving.
10	NC	–	No connection.

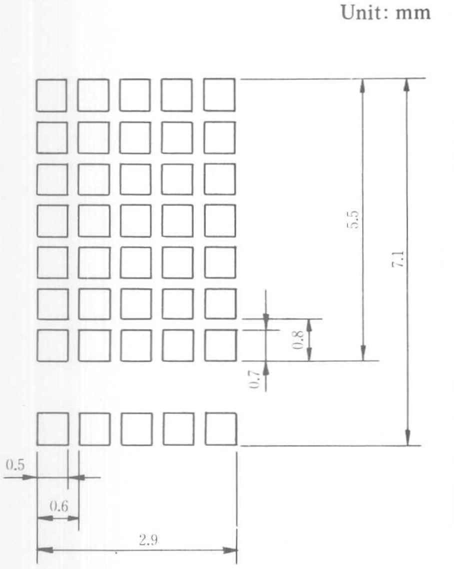

Unit: mm
5.5
7.1
0.8
0.7
0.5
0.6
2.9

Fig. 1 Display pattern

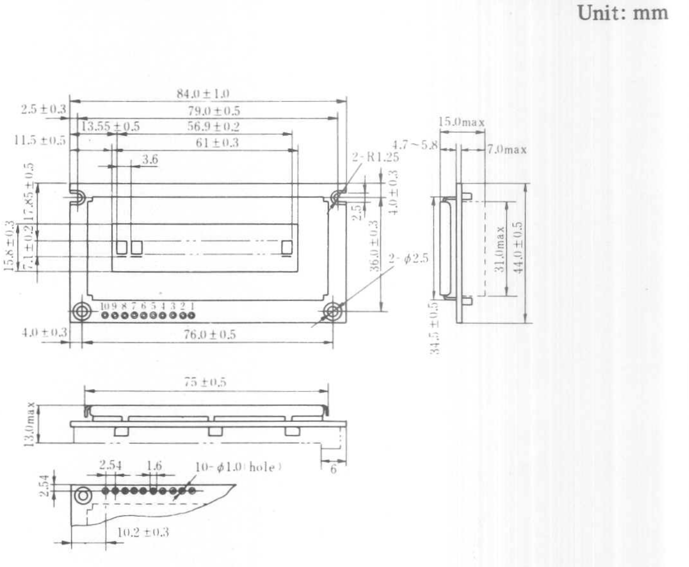

Unit: mm
84.0 ± 1.0
2.5 ±0.3
79.0 ± 0.5
13.55 ± 0.5
56.9 ± 0.2
11.5 ±0.5
61 ± 0.3
3.6
2-R1.25
17.85 ± 0.5
15.8 ±0.3
7.1 ± 0.2
2.5
4.0 ± 0.3
36.0 ± 0.3
2-ϕ2.5
10 9 8 7 6 5 4 3 2 1
4.0 ±0.3
76.0 ± 0.5
15.0max
4.7~5.8
7.0max
31.0max
44.0 ± 0.5
34.5 ±0.5
75 ±0.5
13.0max
6
2.54
1.6
10-ϕ1.0(hole)
2.54
10.2 ±0.3

Fig. 2 External dimensions

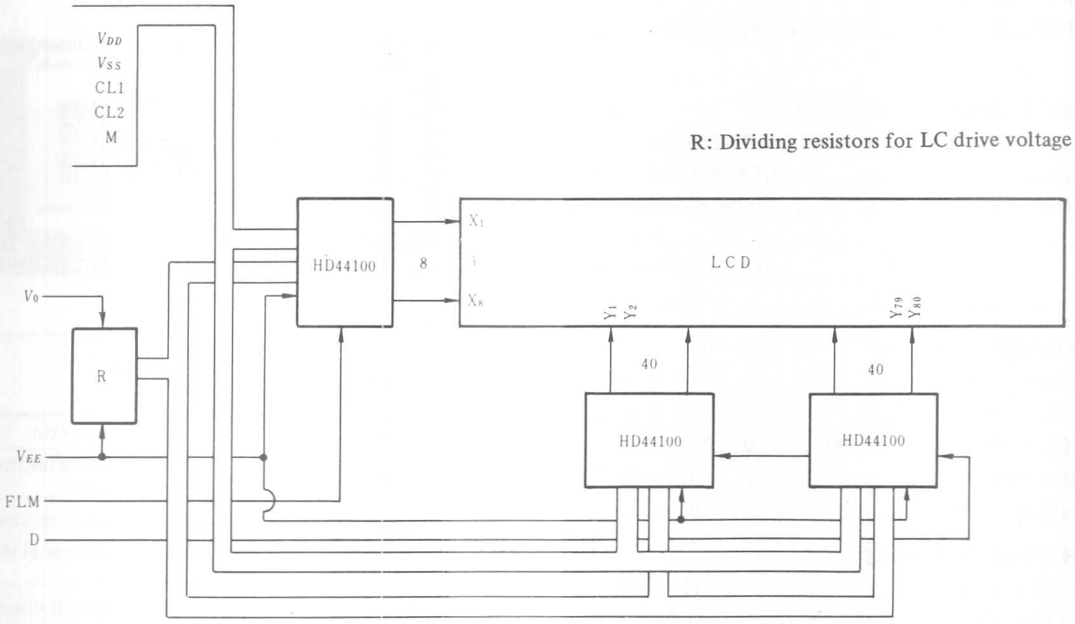

VDD
VSS
CL1
CL2
M
R: Dividing resistors for LC drive voltage
HD44100
8
X1
X8
LCD
Y1
Y2
Y79
Y80
V0
R
40
40
HD44100
HD44100
VEE
FLM
D

Fig. 3 Block diagram

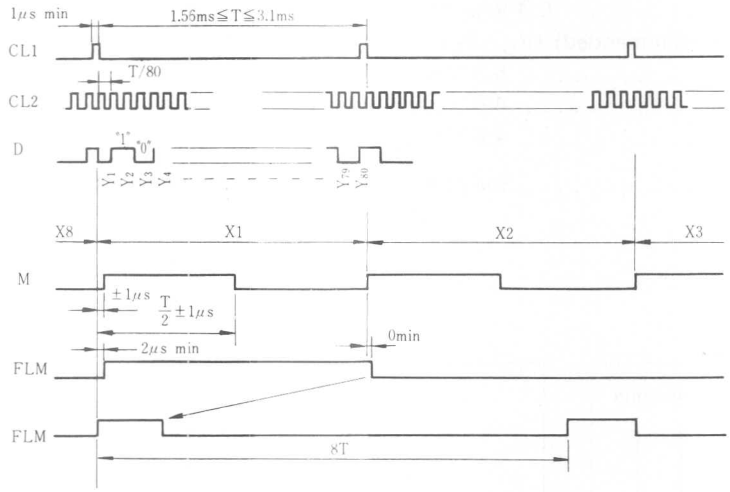
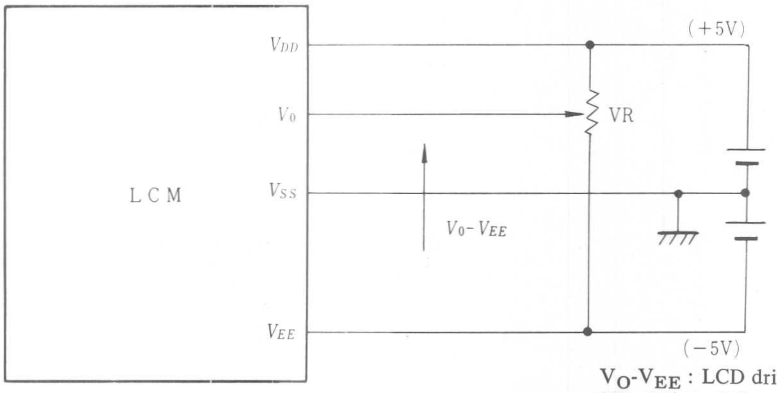

1μs min
1.56ms≦T≦3.1ms
CL1
T/80
CL2
D
"1"
"0"
Y1 Y2 Y3 Y4
Y79 Y80
X8
X1
X2
X3
M
±1μs
T/2 ±1μs
0min
2μs min
FLM
FLM
8T

Fig. 4 Timing chart


LCM
VDD
V0
VSS
VEE
(+5V)
VR
V0-VEE
(−5V)

V_O-V_{EE} : LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 Power supply

H2535

- 32-Position alpha-numeric display
- Control LSI HD43160A attachment type (see page 7)

HITACHI MATRIX
LC DISPLAY H2535

MECHANICAL DATA (Nominal dimensions)

Module size	84W x 44H x 15D (max) mm
Effective display area	61W x 15.8H mm
Character size (5 x 7 dots)	2.9W x 4.1H mm
Pitch	3.6 mm
Dot size	0.5W x 0.5H mm
Weight	about 40 g

ABSOLUTE MAXIMUM RATINGS

Supply voltage ($V_{DD}-V_{SS}$)	7 V max.
($V_{DD}-V_{EE}$)	13.5 V max.
Input voltage (CL1, CL2, D, M, FLM)	$V_{SS} \leqq V_{IN} \leqq V_{DD}$
Operating temperature (Ta)	0 to 50°C
Storage temperature (Tstg)	−20 to 60°C

ELECTRICAL CHARACTERISTICS

Power supplies ($V_{DD}-V_{SS}$)	+5±0.25 V
($V_{EE}-V_{SS}$)	−5±0.5 V
Current consumption +5V	1mA max.
−5V	1 mA max.
Input high voltage	0.7 V_{DD} min.
Input low voltage	0.3 V_{DD} max.
Power supply for LCD drive (Recommended) (V_O-V_{EE})	
at Ta = 0°C	5.3 V typ.
at Ta = 25°C	4.9 V typ.
at Ta = 50°C	4.6 V typ.

OPTICAL DATA .... See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D	H/L	Serial row data of each character.
5	CL2	H→L	Clock signal for shifting the serial data.
6	V_{DD}	–	Power supply for logic circuit.
7	V_{SS}	–	Ground.
8	V_{EE}	–	Power supply for LC driving.
9	V_O	–	Operating voltage for LC driving.
10	NC	–	No connection.

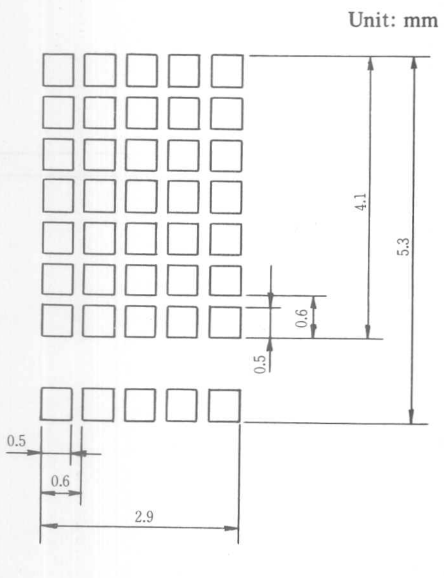

Unit: mm
4.1
5.3
0.6
0.5
0.5
0.6
2.9

Fig. 1 Display pattern

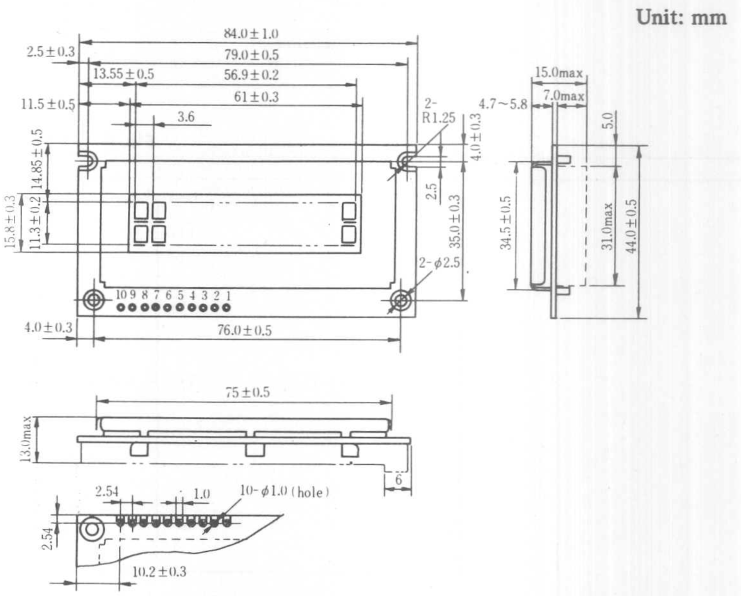
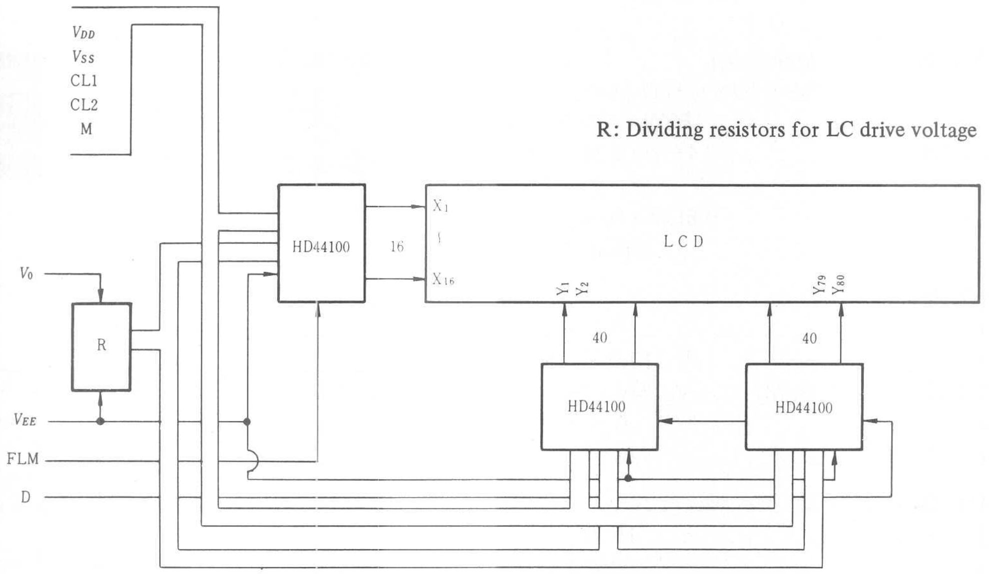

Unit: mm
84.0±1.0
2.5±0.3
79.0±0.5
13.55±0.5
56.9±0.2
11.5±0.5
61±0.3
3.6
2-R1.25
4.0±0.3
14.85±0.5
15.8±0.3
11.3±0.2
2.5
35.0±0.3
2-ϕ2.5
10 9 8 7 6 5 4 3 2 1
4.0±0.3
76.0±0.5
15.0max
7.0max
4.7~5.8
5.0
34.5±0.5
31.0max
44.0±0.5
75±0.5
13.0max
6
2.54
1.0
10-ϕ1.0 (hole)
2.54
10.2±0.3

Fig. 2 External dimensions


V_{DD}
V_{SS}
CL1
CL2
M
V_0
R
V_{EE}
FLM
D
HD44100
16
X_1
X_{16}
LCD
Y_1 Y_2
Y_{79} Y_{80}
40
40
HD44100
HD44100

R: Dividing resistors for LC drive voltage

Fig. 3 Block diagram

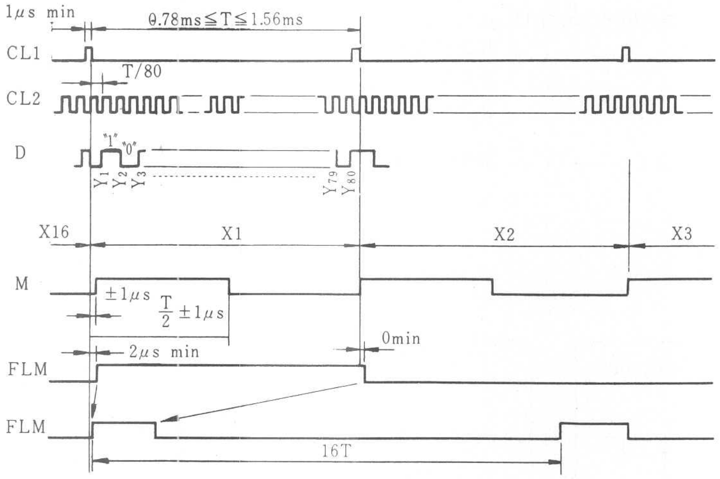
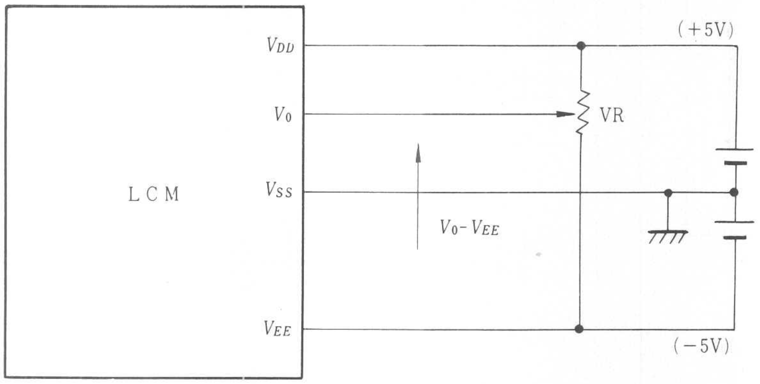

1μs min
0.78ms≦T≦1.56ms
CL1
T/80
CL2
D
"1"
"0"
Y_1 Y_2 Y_3
Y_{79} Y_{80}
X16
X1
X2
X3
M
±1μs
T/2 ±1μs
0min
2μs min
FLM
FLM
16T

Fig. 4 Timing chart

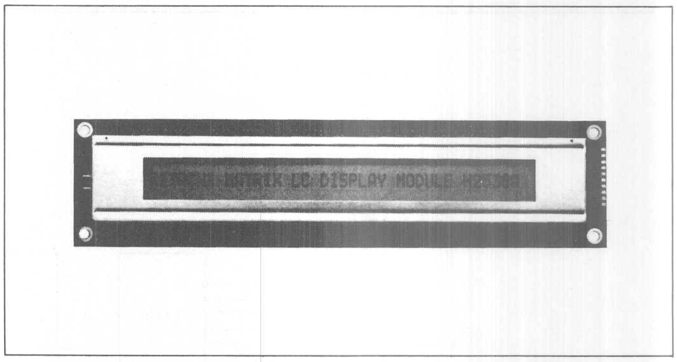

LCM
V_{DD}
V_0
V_{SS}
V_{EE}
(+5V)
VR
V_0-V_{EE}
(−5V)

V_O-V_{EE} : LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 Power supply

H2538A

- 40-Position alpha-numeric display
- Control LSI HD43160A attachment type (see page 7)



MECHANICAL DATA (Nominal dimensions)

Module size	220W x 50H x 15D (max) mm
Effective display area	163W x 17H mm
Character size (5 x 7 dots)	3.15W x 5.5H mm
Pitch	3.9 mm
Dot size	0.55W x 0.7H mm
Weight	about 100 g

ABSOLUTE MAXIMUM RATINGS

Supply voltage ($V_{DD}-V_{SS}$)	7 V max.
($V_{DD}-V_{EE}$)	13.5 V max.
Input voltage (CL1, CL2, D, M, FLM)	$V_{SS} \leqq V_{IN} \leqq V_{DD}$
Operating temperature (Ta)	0 to 50°C
Storage temperature (Tstg)	–20 to 60°C

ELECTRICAL CHARACTERISTICS

Power supplies ($V_{DD}-V_{SS}$)	+5±0.25 V
($V_{EE}-V_{SS}$)	–5±0.5 V
Current consumption +5V	1 mA max.
–5V	1 mA max.
Input high voltage	0.7 V_{DD} min.
Input low voltage	0.3 V_{DD} max.
Power supply for LCD drive (Recommended) (V_O-V_{EE})	
at Ta = 0°C	5.3 V typ.
at Ta = 25°C	4.5 V typ.
at Ta = 50°C	3.7 V typ.

OPTICAL DATA	See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D	H/L	Serial row data of each character.
5	CL2	H→L	Clock signal for shifting the serial data.
6	V_{DD}	–	Power supply for logic circuit.
7	V_{SS}	–	Ground.
8	V_{EE}	–	Power supply for LC driving.
9	V_O	–	Operating voltage for LC driving.
10	NC	–	No connection.

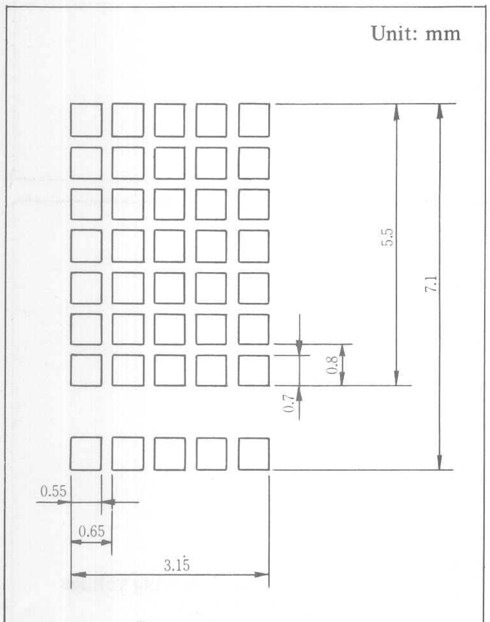


Fig. 1 Display pattern

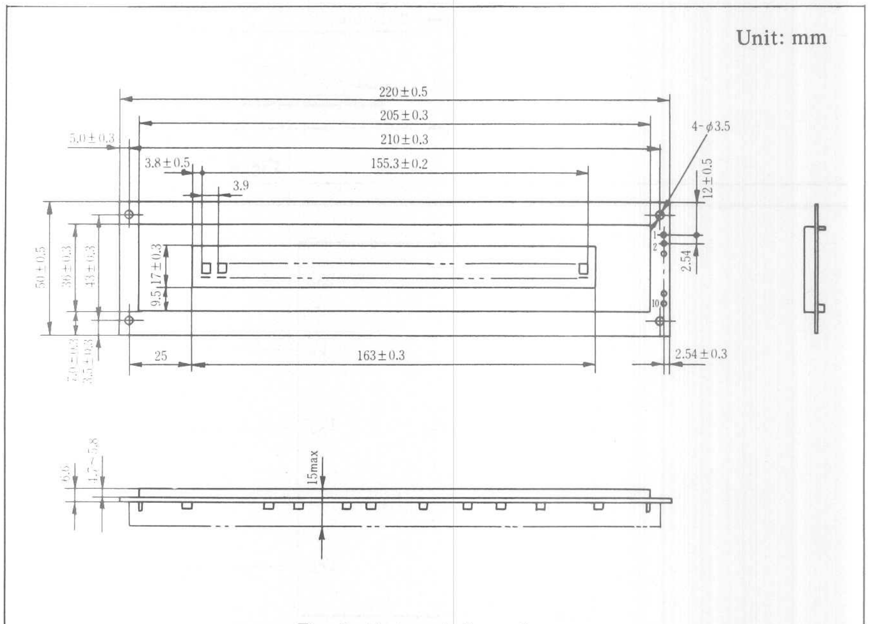
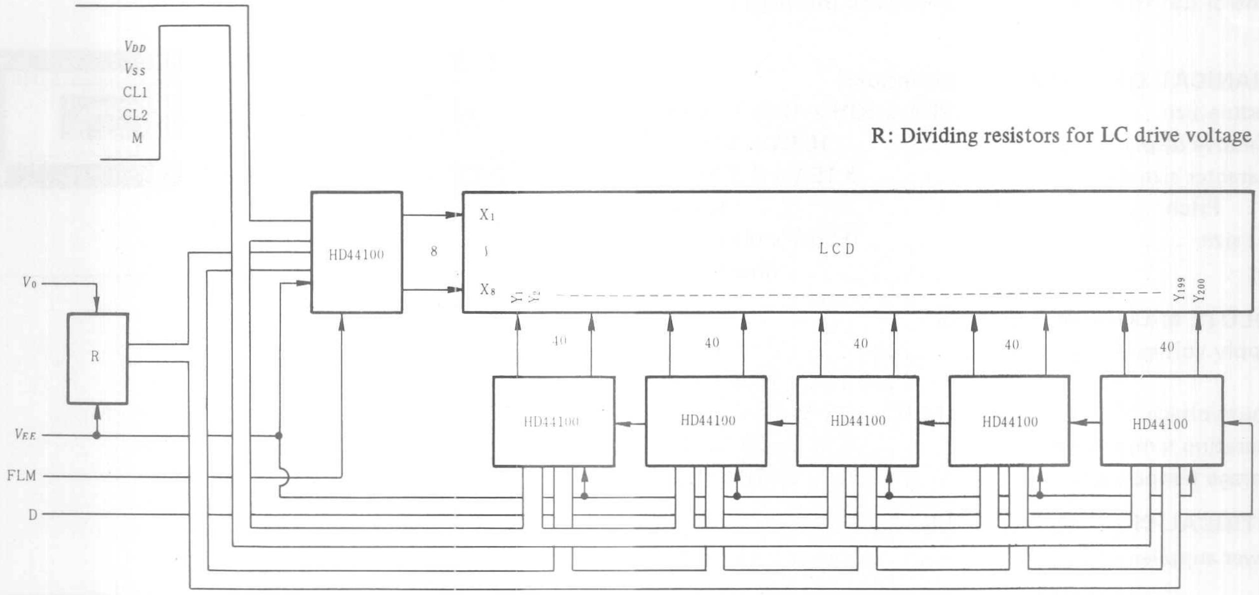


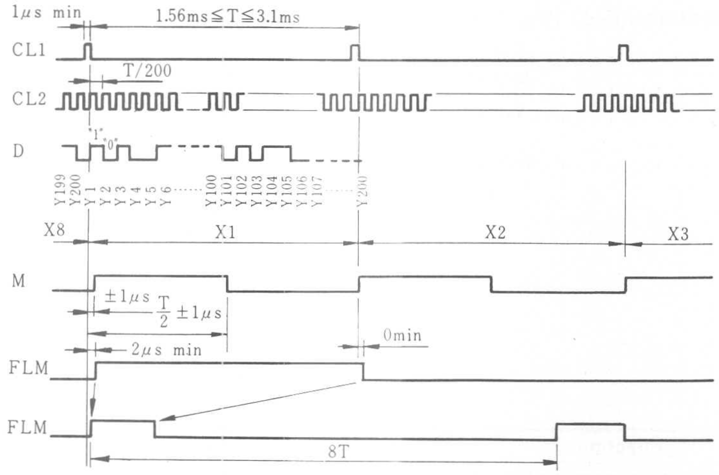
Fig. 2 External dimensions



V_{DD}
V_{SS}
CL1
CL2
M
V_0
R
V_{EE}
FLM
D
HD44100
8
X_1
X_8
LCD
Y_1
Y_2
Y199
Y200
40
40
40
40
40
HD44100
HD44100
HD44100
HD44100
HD44100

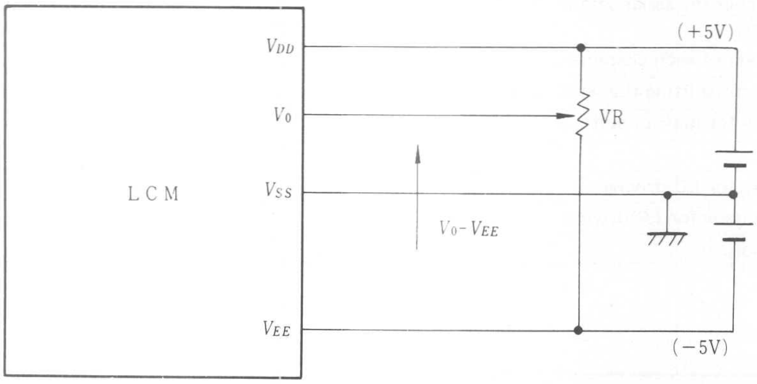
R: Dividing resistors for LC drive voltage

Fig. 3 Block diagram



1μs min
1.56ms≦T≦3.1ms
CL1
T/200
CL2
D
"1"
"0"
Y199
Y200
Y1
Y2
Y3
Y4
Y5
Y6
Y100
Y101
Y102
Y103
Y104
Y105
Y106
Y107
Y200
X8
X1
X2
X3
M
±1μs
T/2 ±1μs
2μs min
0min
FLM
FLM
8T

Fig. 4 Timing chart



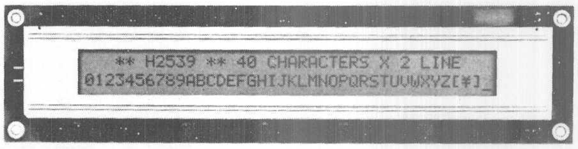
LCM
V_{DD}
V_0
V_{SS}
V_{EE}
(+5V)
VR
V_0-V_{EE}
(−5V)

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 Power supply

H2539

- 80-Position alpha-numeric display.
- Control LSI HD43160A attachment type (see page 7)


** H2539 ** 40 CHARACTERS X 2 LINE
0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZ[¥]_

MECHANICAL DATA (Nominal dimensions)

Module size	220W x 50H x 15D (max)mm
Effective display area	163W x 17H mm
Character size (5 x 7 dots)	3.15W x 4.45H mm
Pitch	3.9 mm
Dot size	0.55W x 0.55H mm
Weight	about 100 g

ABSOLUTE MAXIMUM RATINGS

Supply voltage ($V_{DD}-V_{SS}$)	7 V max.
($V_{DD}-V_{EE}$)	13.5 V max.
Input voltage (CL1, CL2, D, M, FLM)	$V_{SS} \leqq V_{IN} \leqq V_{DD}$
Operating temperature (Ta)	0 to 50°C
Storage temperature (Tstg)	−20 to 60°C

ELECTRICAL CHARACTERISTICS

Power supplies ($V_{DD}-V_{SS}$)	+5±0.25 V
($V_{EE}-V_{SS}$)	−5±0.5 V
Current consumption +5V	1 mA max.
−5V	1 mA max.
Input high voltage	0.7 V_{DD} min.
Input low voltage	0.3 V_{DD} max.
Power supply for LCD drive (Recommended) (V_O-V_{EE})	
at Ta = 0°C	5.3 V typ.
at Ta = 25°C	4.9 V typ.
at Ta = 50°C	4.6 V typ.

OPTICAL DATA . . . . See page 6

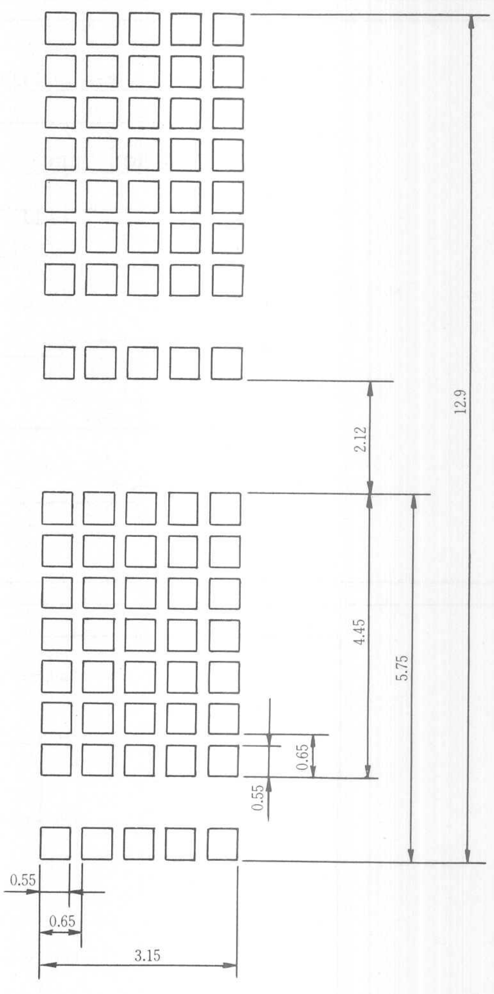


Fig. 1 Display pattern

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D	H/L	Serial row data of each character.
5	CL2	H→L	Clock signal for shifting the serial data.
6	V_{DD}	–	Power supply for logic circuit.
7	V_{SS}	–	Ground.
8	V_{EE}	–	Power supply for LC driving.
9	V_O	–	Operating voltage for LC driving.
10	NC	–	No connection.

Unit: mm

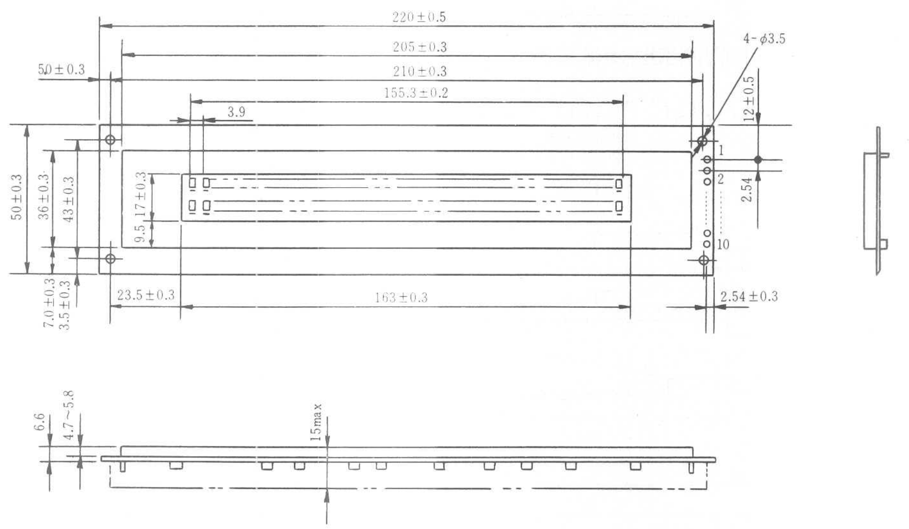
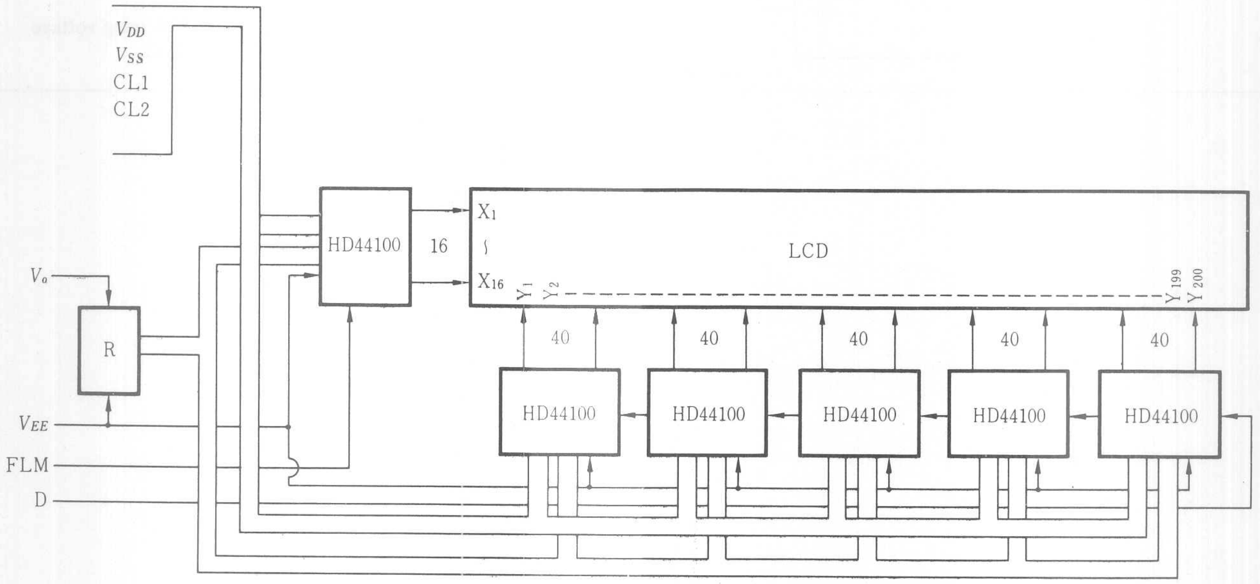

220±0.5
205±0.3
210±0.3
155.3±0.2
5.0±0.3
3.9
4-φ3.5
12±0.5
1
2
2.54
10
50±0.3
36±0.3
43±0.3
9.5
17±0.3
7.0±0.3
3.5±0.3
23.5±0.3
163±0.3
2.54±0.3
6.6
4.7~5.8
15max

Fig. 2 External dimensions


V_{DD}
V_{SS}
CL1
CL2
V_o
R
V_{EE}
FLM
D
HD44100
16
X_1
X_{16}
LCD
Y_1
Y_2
Y_{199}
Y_{200}
40
40
40
40
40
HD44100
HD44100
HD44100
HD44100
HD44100

R: Dividing resistors for LC drive voltage.

Fig. 3 Block diagram

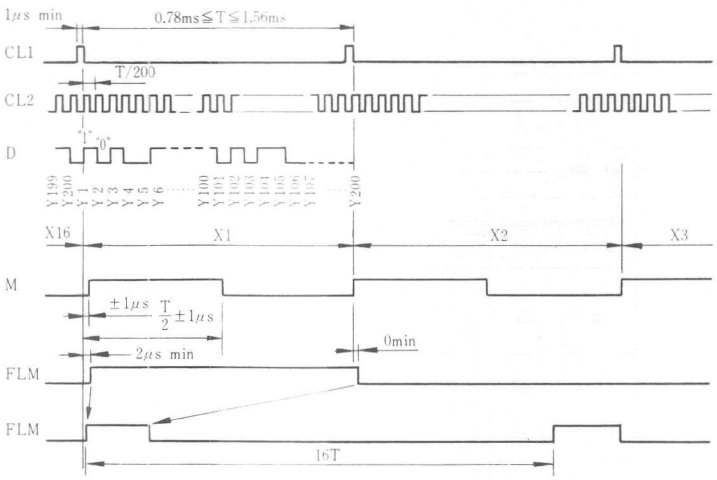
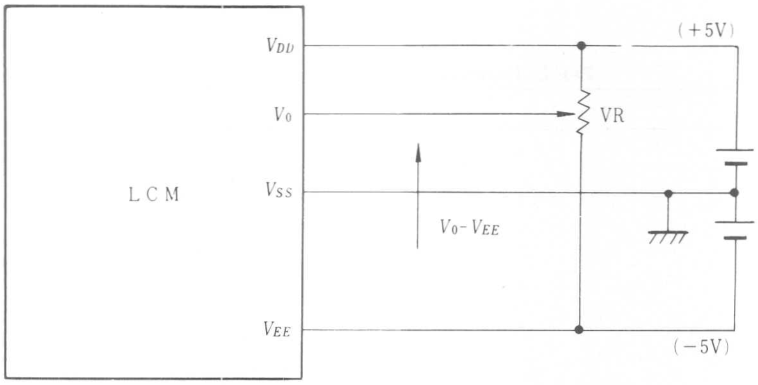

1μs min
0.78ms≦T≦1.56ms
CL1
T/200
CL2
D
"1"
"0"
Y199
Y200
Y1
Y2
Y3
Y4
Y5
Y6
Y100
Y101
Y102
Y103
Y104
Y105
Y106
Y107
Y200
X16
X1
X2
X3
M
±1μs
T/2 ±1μs
2μs min
0min
FLM
FLM
16T

Fig. 4 Timing chart

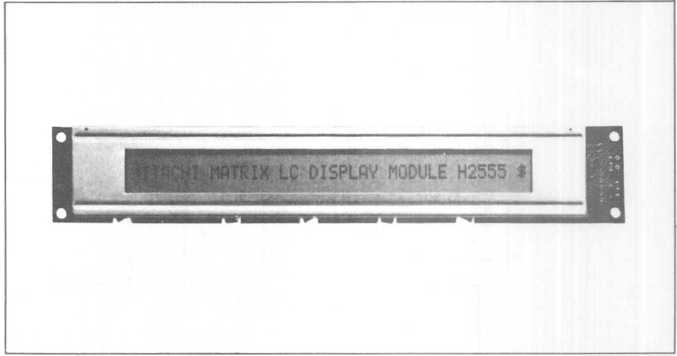

LCM
VDD
V0
VSS
VEE
V0-VEE
VR
(+5V)
(-5V)

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 Power supply

H2555

- 40-Position alpha-numeric display
- Control LSI HD43160A attachment type (see page 7)


HITACHI MATRIX LC DISPLAY MODULE H2555

MECHANICAL DATA (Nominal dimensions)

Module size	227W x 38.5H x 15D (max) mm
Effective display are	160W x 17H mm
Character size (5 x 7 dots)	3.15W x 5.5H mm
Pitch	3.9 mm
Dot size	0.55W x 0.7H mm
Weight	about 100g

ABSOLUTE MAXIMUM RATINGS

Supply voltage ($V_{DD}-V_{SS}$)	7 V max.
($V_{DD}-V_{EE}$)	13.5 V max.
Input voltage (CL1, CL2, D, M, FLM)	$V_{SS} \leqq V_{IN} \leqq V_{DD}$
Operating temperature (Ta)	0 to 50°C
Storage temperature (Tstg)	−20 to 60°C

ELECTRICAL CHARACTERISTICS

Power supplies ($V_{DD}-V_{SS}$)	+5±0.25 V
($V_{EE}-V_{SS}$)	−5±0.5 V
Current consumption +5V	1 mA max.
−5V	1 mA max.
Input high voltage	0.7 V_{DD} min.
Input low voltage	0.3 V_{DD} max.

Power supply for LCD drive (Recommended) (V_O-V_{EE})

at Ta = 0°C	5.3 V
at Ta = 25°C	4.5 V
at Ta = 50°C	3.7 V

OPTICAL DATA .... See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D	H/L	Serial row data of each character.
5	CL2	H→L	Clock signal for shifting the serial data.
6	V_{DD}	–	Power supply for logic circuit.
7	V_{SS}	–	Ground.
8	V_{EE}	–	Power supply for LC driving.
9	V_O	–	Operating voltage for LC driving.
10	NC	–	No connection.

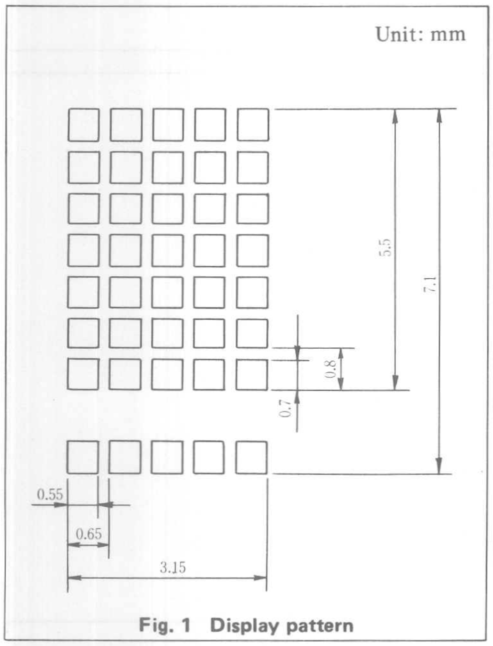

Unit: mm
5.5
7.1
0.8
0.7
0.55
0.65
3.15

Fig. 1 Display pattern

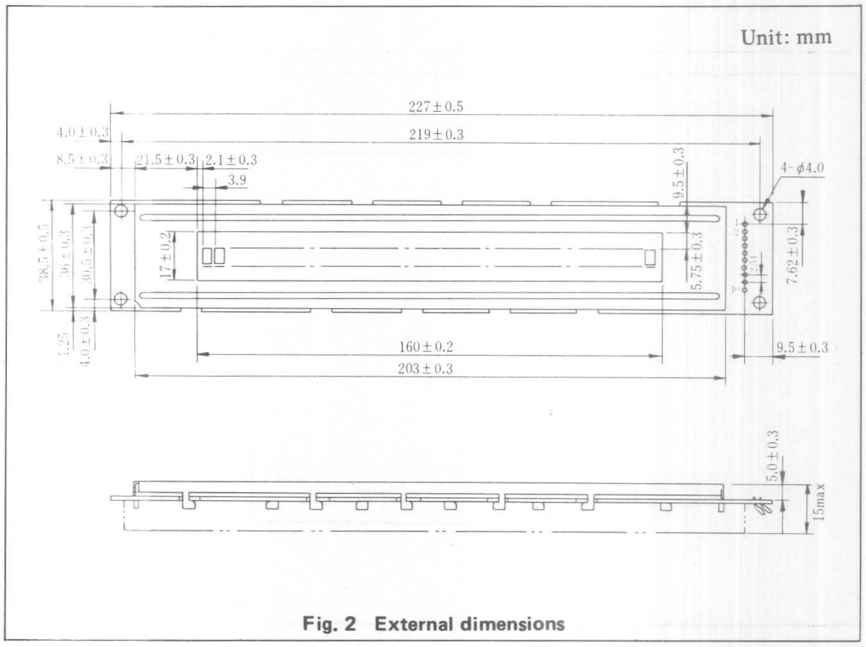
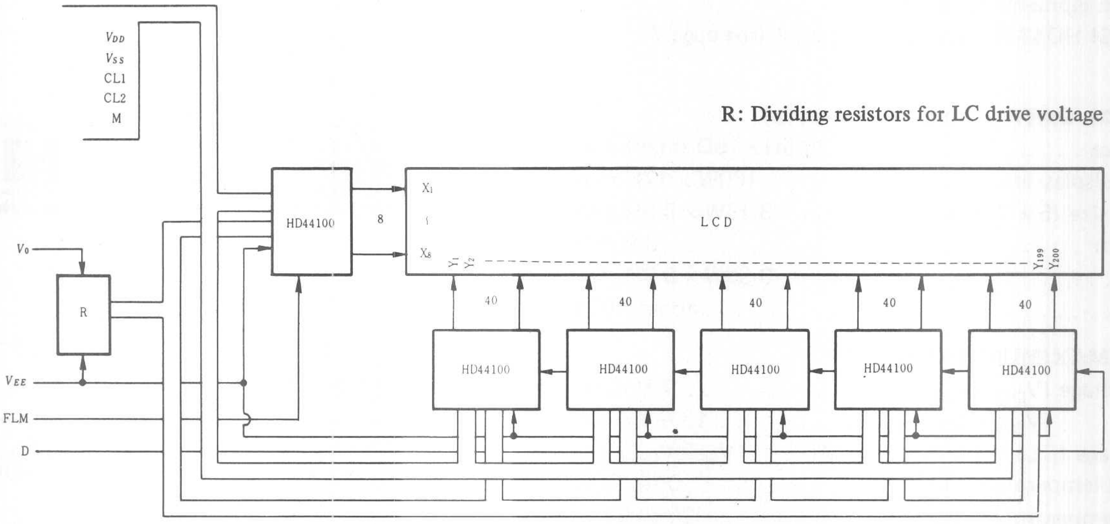

Unit: mm
227±0.5
219±0.3
4.0±0.3
8.5±0.3
21.5±0.3
2.1±0.3
3.9
9.5±0.3
4-φ4.0
38.5±0.3
36±0.3
30.5±0.3
17±0.2
5.75±0.3
7.62±0.3
1.25
4.0±0.3
160±0.2
203±0.3
9.5±0.3
5.0±0.3
15max

Fig. 2 External dimensions


VDD
VSS
CL1
CL2
M
V0
R
VEE
FLM
D
HD44100
8
X1
X8
LCD
Y1
Y2
Y199
Y200
40
HD44100

R: Dividing resistors for LC drive voltage

Fig. 3 Block diagram

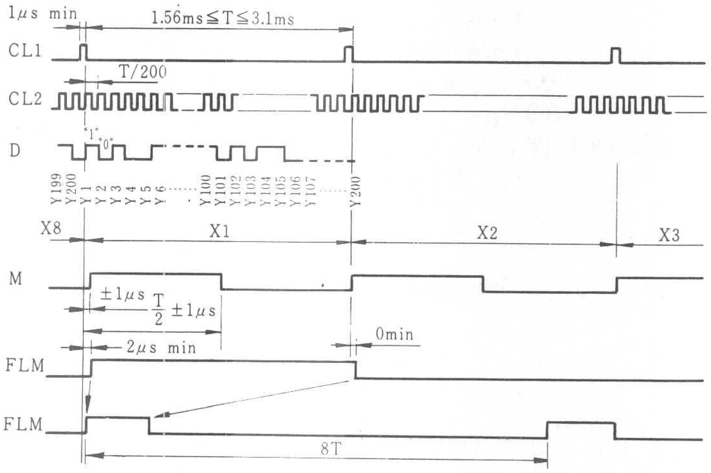
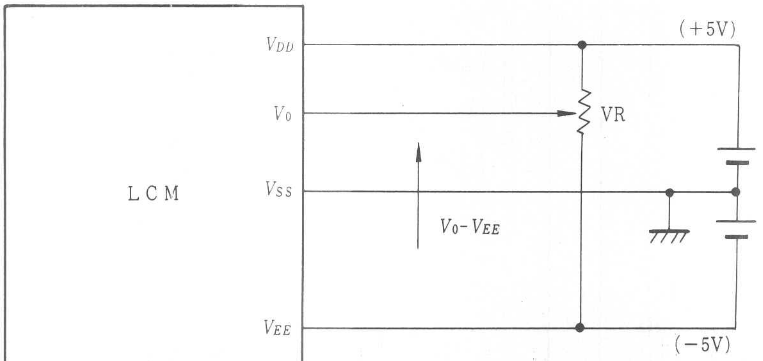

1μs min
1.56ms≦T≦3.1ms
CL1
T/200
CL2
"1"
"0"
D
Y199
Y200
Y1
Y2
Y3
Y4
Y5
Y6
Y100
Y101
Y102
Y103
Y104
Y105
Y106
Y107
Y200
X8
X1
X2
X3
M
±1μs
T/2 ±1μs
2μs min
0min
FLM
FLM
8T

Fig. 4 Timing chart

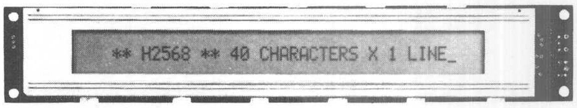

LCM
VDD
V0
VSS
VEE
(+5V)
VR
V0-VEE
(−5V)

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 Power supply

H2568

- 40-Position alpha-numeric display
- Control LSI HD43160A attachment type (see page 7)


** H2568 ** 40 CHARACTERS X 1 LINE_

MECHANICAL DATA (Nominal dimensions)

Module size	227W x 38.5 x 15D (max) mm
Effective display area	163W x 17H mm
Character size (5 x 10 dots)	3.15W x 8.7H mm
Pitch	3.9 mm
Dot size	0.55W x 0.7H mm
Weight	about 100 g

ABSOLUTE MAXIMUM RATINGS

Supply voltage ($V_{DD}-V_{SS}$)	7 V max.
($V_{DD}-V_{EE}$)	13.5 V max.
Input voltage (CL1, CL2, D, M, FLM)	$V_{SS} \leqq V_{IN} \leqq V_{DD}$
Operating temperature (Ta)	0 to 50°C
Storage temperature (Tstg)	–20 to 60°C

ELECTRICAL CHARACTERISTICS

Power supplies ($V_{DD}-V_{SS}$)	+5±0.25 V
($V_{EE}-V_{SS}$)	–5±0.5 V
Current consumption +5V	1 mA max.
–5V	1 mA max.
Input high voltage	0.7 V_{DD} min.
Input low voltage	0.3 V_{DD} max.
Power supply for LCD drive (Recommended) (V_O-V_{EE})	
at Ta = 0°C	5.8 V typ.
at Ta = 25°C	4.9 V typ.
at Ta = 50°C	4.0 V typ.

OPTICAL DATA .... See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D	H/L	Serial row data of each character.
5	CL2	H→L	Clock signal for shifting the serial data.
6	V_{DD}	–	Power supply for logic circuit.
7	V_{SS}	–	Ground.
8	V_{EE}	–	Power supply for LC driving.
9	V_O	–	Operating voltage for LC driving.
10	NC	–	No connection.

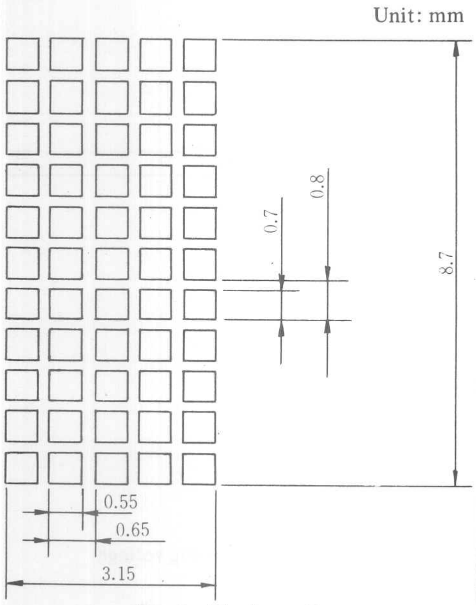

Unit: mm
0.7
0.8
8.7
0.55
0.65
3.15

Fig. 1 Display pattern

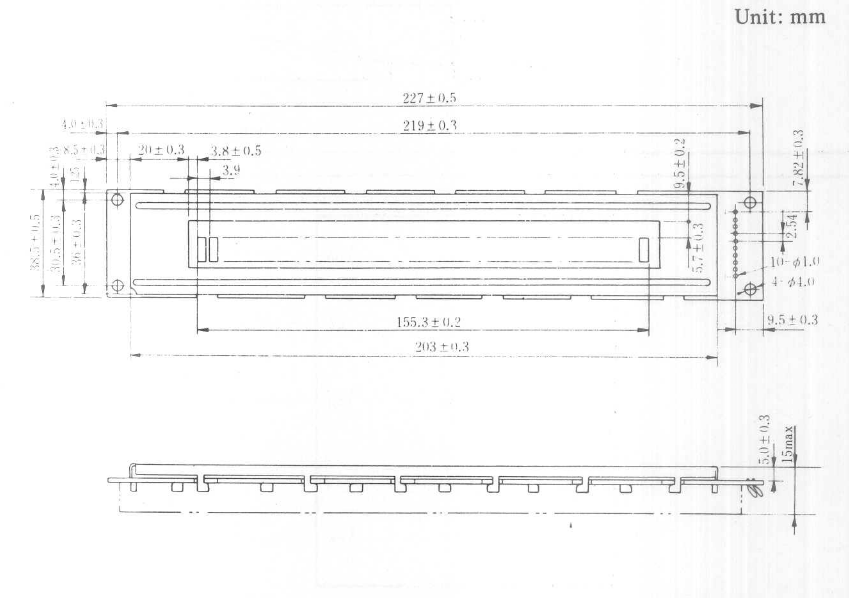
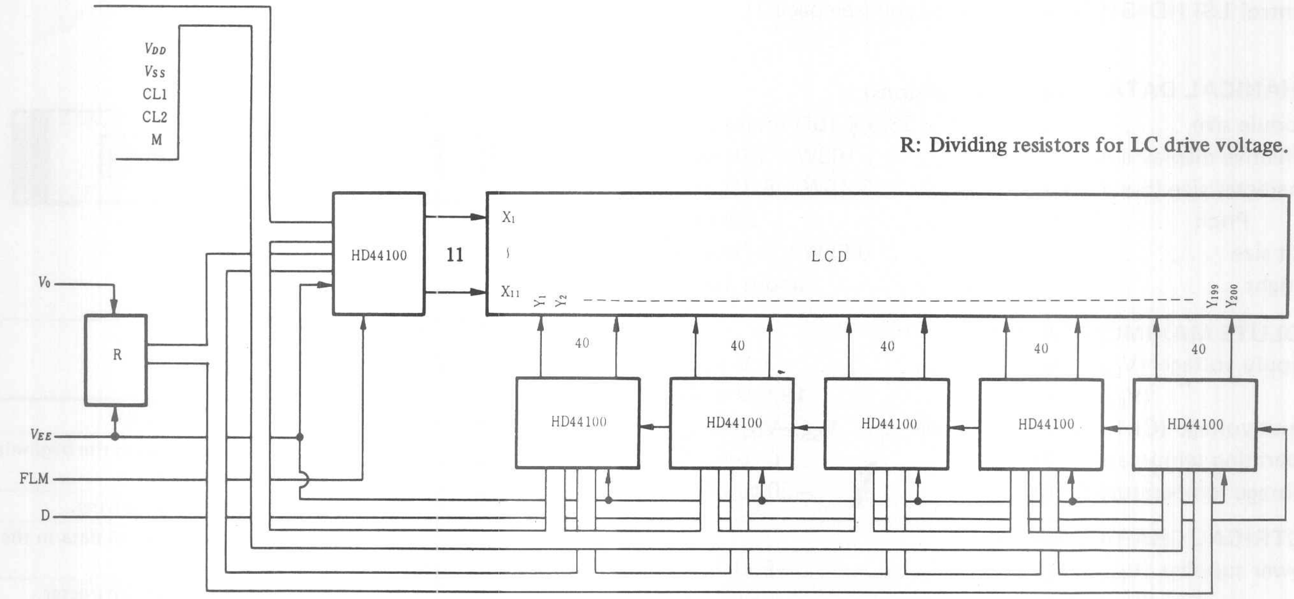

Unit: mm
227 ± 0.5
219 ± 0.3
4.0 ± 0.3
8.5 ± 0.3
20 ± 0.3
3.8 ± 0.5
3.9
4.0 ± 0.3
1.25
38.5 ± 0.5
30.5 ± 0.3
36 ± 0.3
9.5 ± 0.2
7.82 ± 0.3
2.54
5.7 ± 0.3
10- ϕ1.0
4- ϕ4.0
9.5 ± 0.3
155.3 ± 0.2
203 ± 0.3
5.0 ± 0.3
15max

Fig. 2 External dimensions


V_{DD}
V_{SS}
CL1
CL2
M
V_0
R
V_{EE}
FLM
D
HD44100
11
X_1
X_{11}
LCD
Y_1
Y_2
Y_{199}
Y_{200}
40
40
40
40
40
HD44100
HD44100
HD44100
HD44100
HD44100

R: Dividing resistors for LC drive voltage.

Fig. 3 Block diagram

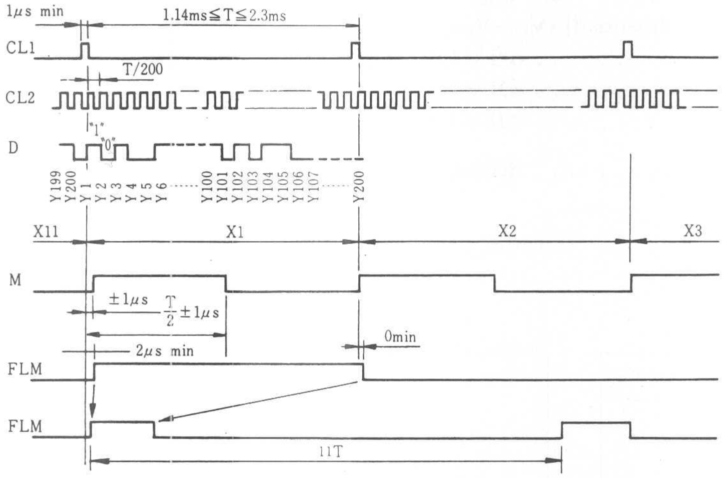
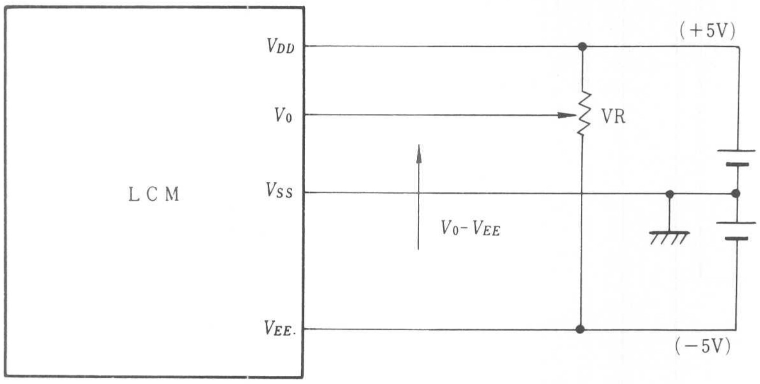

1μs min
1.14ms≦T≦2.3ms
CL1
T/200
CL2
"1"
"0"
D
Y199
Y200
Y1
Y2
Y3
Y4
Y5
Y6
Y100
Y101
Y102
Y103
Y104
Y105
Y106
Y107
Y200
X11
X1
X2
X3
M
±1μs
T/2 ±1μs
2μs min
0min
FLM
FLM
11T

Fig. 4 Timing chart


LCM
V_{DD}
V_0
V_{SS}
V_{EE}
(+5V)
VR
V_0- V_{EE}
(−5V)

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 Power supply

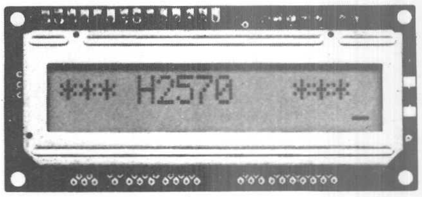
BUILT-IN CONTROL LSI TYPE LCD MODULE

This is a dot matrix LCD module containing the control LSI for character display. Functions such as control, refresh, and display are operated by the built-in control LSI.
This LCD module can display 160 type JIS characters and symbols and 32 type special characters and symbols. This LCD module can be interfaced to the 4-bit or 8-bit MPU, so the character display and the display shift can be easily operated by using control commands. This LCD module also contains the character generator RAM, hence user's patterns can be displayed.

H2570 · LM015 · LM027 · H2571 · H2572 · LM016
LM032 · LM017 · LM018 · LM041

H2570

- 16-Position alpha-numeric display.
- Built-in control LSI HD44780 type (see page 7)



MECHANICAL DATA (Nominal dimensions)

Module size	80W x 36H x 12D (max) mm
Effective display area	64.5W x 13.8H mm
Character size (5 x 10 dots)	3.15W x 7.9H mm
Pitch	3.7 mm
Dot size	0.55W x 0.7H mm
Weight	about 25g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltag (V_i)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTRISTICS

Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

Input "high" voltage (V_{iH})	2.2 V min.
Input "low" voltage (V_{iL})	0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$ = 0.2 mA)	2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA)	0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V)	0.5 mA typ. 2.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

	Du=1/8	Du=1/11
at Ta = 0°C	4.0	4.2 V typ.
at Ta = 25°C	3.7	3.8 V typ.
at Ta = 50°C	3.3	3.3 V typ.

OPTICAL DATA . . . . See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of DB_4 ~ DB_7 and DB_0 ~ DB_3 are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of DB_4 ~ DB_7 when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of DB_0 ~ DB_3 when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of DB_0 ~ DB_7.

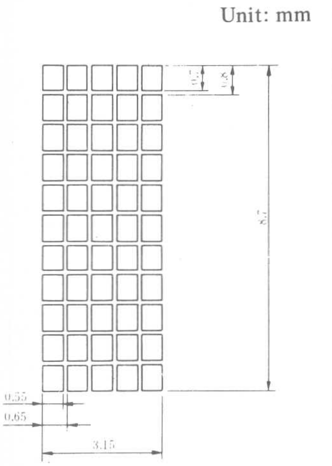


Fig. 1 Display pattern

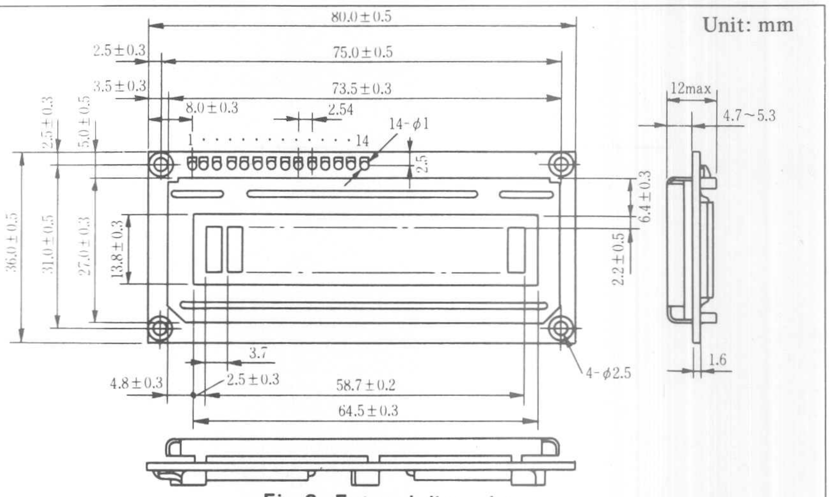


Fig. 2 External dimensions

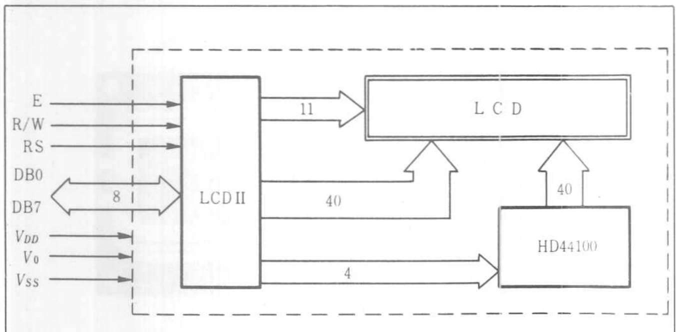
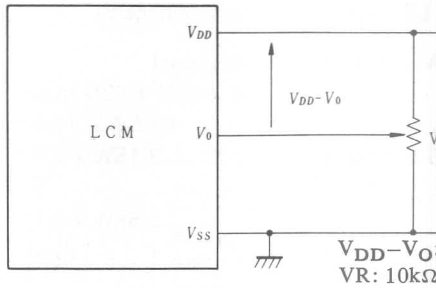

E
R/W
RS
DB0
DB7
V_{DD}
V_0
V_{SS}
8
LCD II
11
LCD
40
40
HD44100
4

Fig. 3 Block diagram


LCM
V_{DD}
V_0
V_{SS}
(+5V)
V_{DD}-V_0
VR
V_{DD}

$V_{DD}-V_O$: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	—	—	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	—	—	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	—	—	ns
Data delay time	t_{DDR}	Fig. 6	—	—	320	ns
Data set up time	t_{DSW}	Fig. 5	225	—	—	ns
Hold time	t_H	Fig. 5, Fig. 6	10	—	—	ns

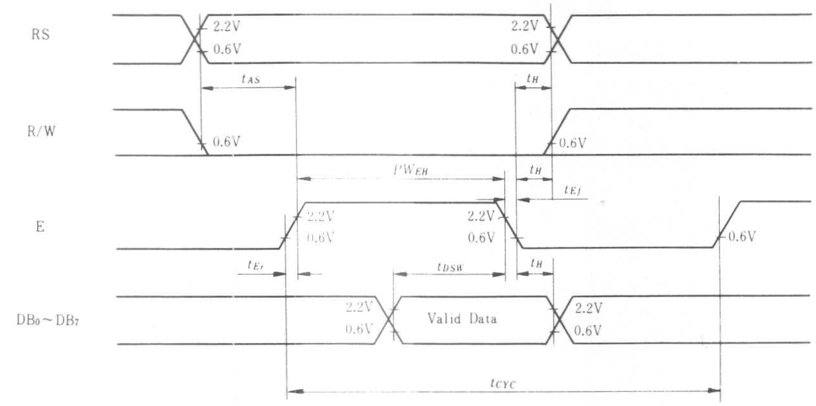

RS
2.2V
0.6V
2.2V
0.6V
t_{AS}
t_H
R/W
0.6V
0.6V
PW_{EH}
t_H
t_{Ef}
E
2.2V
0.6V
2.2V
0.6V
0.6V
t_{Er}
t_{DSW}
t_H
DB₀~DB₇
2.2V
0.6V
Valid Data
2.2V
0.6V
t_{CYC}

Fig. 5 Interface timing (data write)

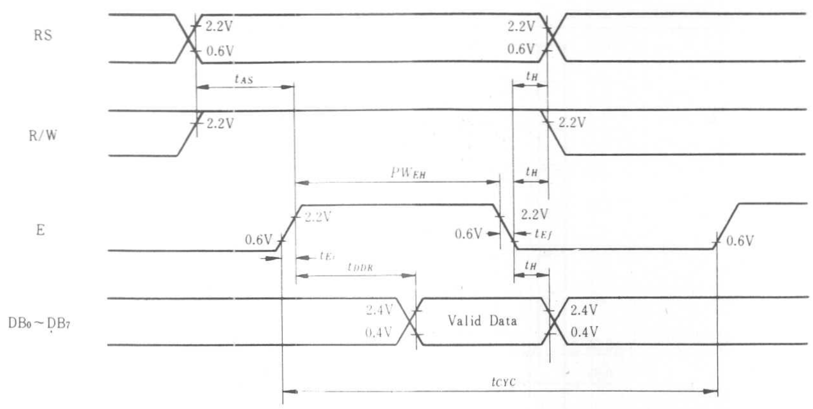
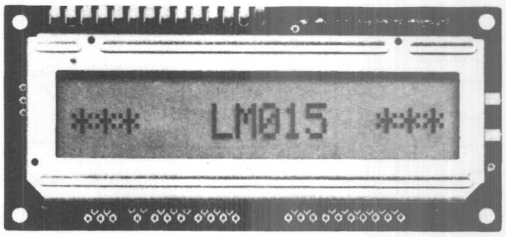

RS
2.2V
0.6V
2.2V
0.6V
t_{AS}
t_H
R/W
2.2V
2.2V
PW_{EH}
t_H
E
2.2V
0.6V
0.6V
2.2V
t_{Ef}
0.6V
t_{Er}
t_{DDR}
t_H
DB₀~DB₇
2.4V
0.4V
Valid Data
2.4V
0.4V
t_{CYC}

Fig. 6 Interface timing (data read)

LM015

- 16-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)



MECHANICAL DATA (Nominal dimensions)

Module size	80W x 36H x 12D (max) mm
Effective display area	64.5W x 13.8H mm
Character size (5 x 7 dots)	3.15W x 5.5H mm
Pitch	3.7 mm
Dot size	0.55W x 0.7H mm
Weight	about 25 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0V ± 0.25 V

Input "high" voltage (Vi_H)	2.2 V min.
Input "low" voltage (Vi_L)	0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$ = 0.2 mA)	2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA)	0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V)	0.5 mA typ. 2.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)
Du = 1/8

at Ta = 0°C	4.0 V typ.
at Ta = 25°C	3.7 V typ.
at Ta = 50°C	3.3 V typ.

OPTICAL DATA .... See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.

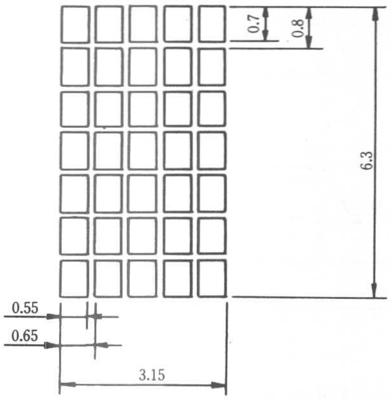


Fig. 1 Display pattern

Unit: mm

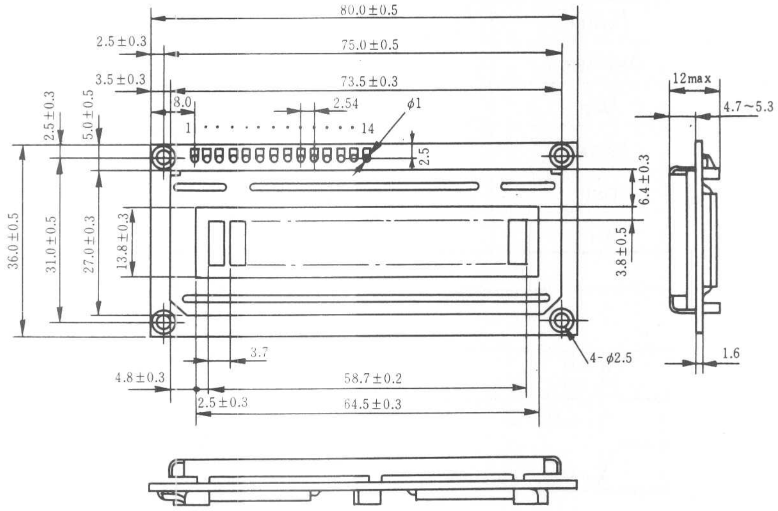

80.0±0.5
2.5±0.3
75.0±0.5
3.5±0.3
73.5±0.3
8.0
2.54
φ1
1
14
2.5
2.5±0.3
5.0±0.5
36.0±0.5
31.0±0.5
27.0±0.3
13.8±0.3
6.4±0.3
3.8±0.5
3.7
4.8±0.3
58.7±0.2
2.5±0.3
64.5±0.3
4-φ2.5
12max
4.7~5.3
1.6

Fig. 2 External dimensions

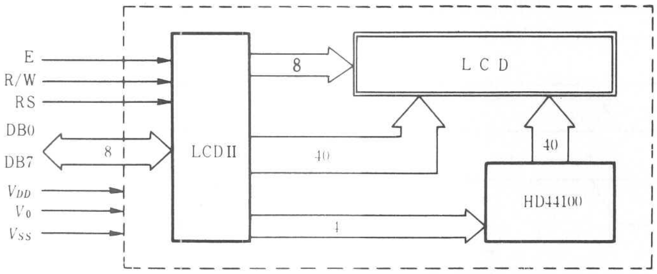
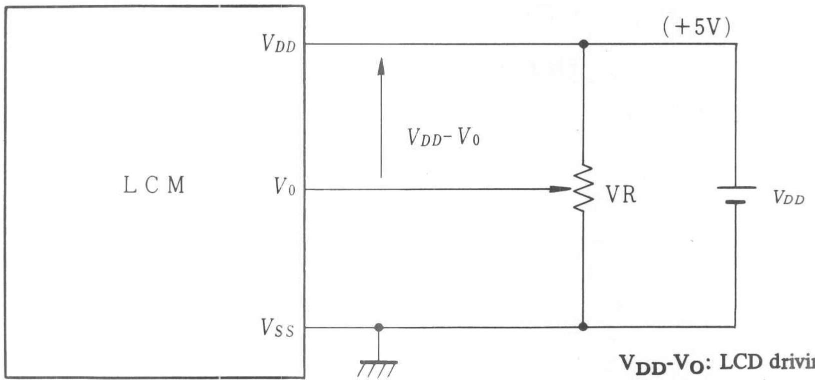

E
R/W
RS
DB0
DB7
8
V_{DD}
V_0
V_{SS}
LCDII
8
LCD
40
40
HD44100
4

Fig. 3 Block diagram


LCM
V_{DD}
V_0
V_{SS}
V_{DD}- V_0
(+5V)
VR
V_{DD}

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	—	—	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	—	—	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	—	—	ns
Data delay time	t_{DDR}	Fig. 6	—	—	320	ns
Data set up time	t_{DSW}	Fig. 5	225	—	—	ns
Hold time	t_H	Fig. 5, Fig. 6	10	—	—	ns

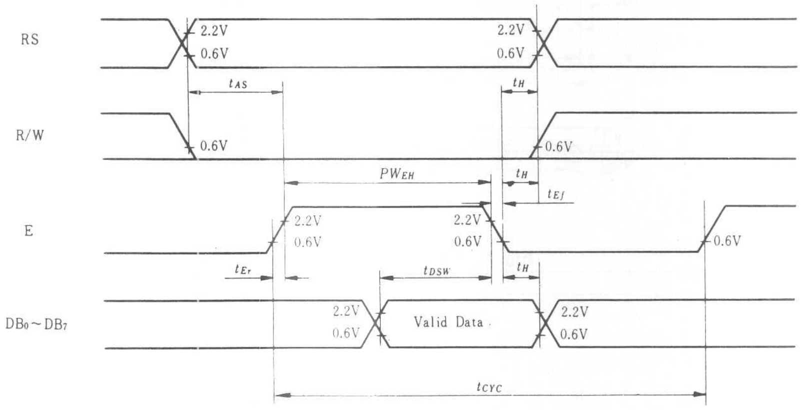

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

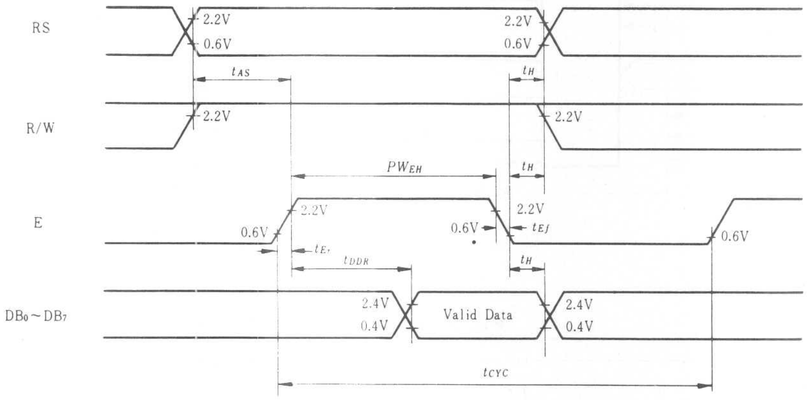

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
0.6V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

LM027

- 24-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	126W x 36H x 12D (max) mm
Effective display area	100W x 13.8H mm
Character size (5 x 10 dots)	3.15W x 7.9H mm
Pitch	3.75 mm
Dot size	0.55W x 0.7H mm
Weight	about 40 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTERISTICS

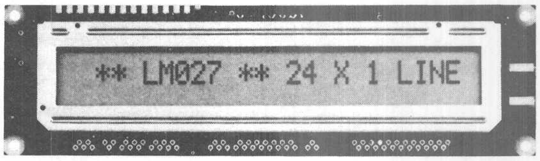
Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

Input "high" voltage (Vi_H)	2.2 V min.
Input "low" voltage (Vi_L)	0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$=0.2 mA)	2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA)	0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V)	0.5 mA typ. 2.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

	Du=1/8	Du=1/11
at Ta = 0°C	4.0	4.2 V typ.
at Ta = 25°C	3.7	3.8 V typ.
at Ta = 50°C	3.3	3.3 V typ.

OPTICAL DATA	See page 6



INTERNAL PIN CONNECTION

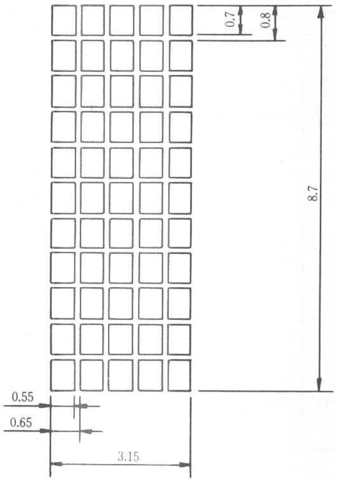
Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

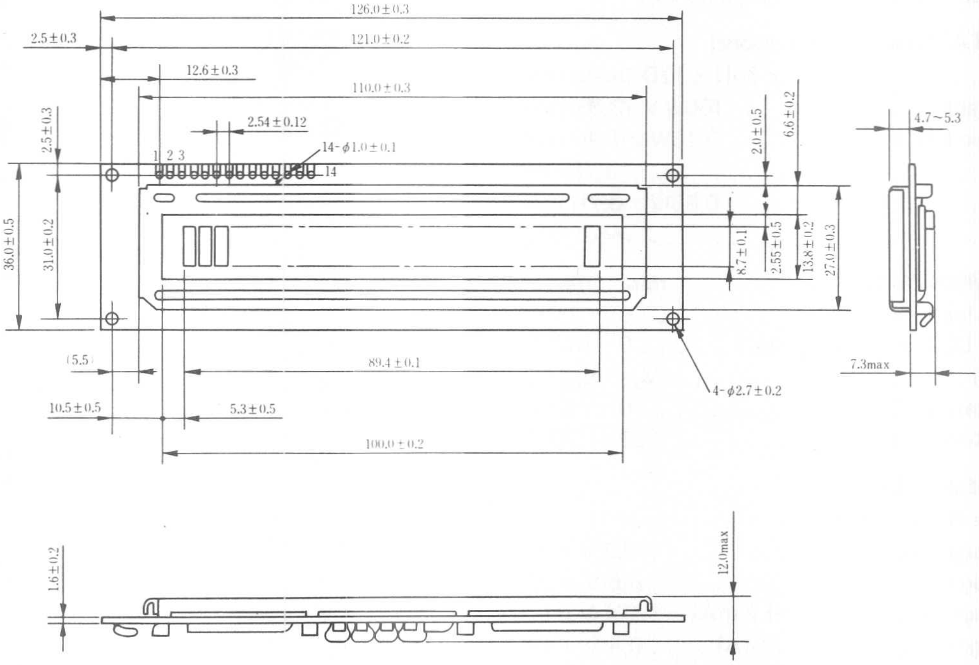
(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.



Unit: mm

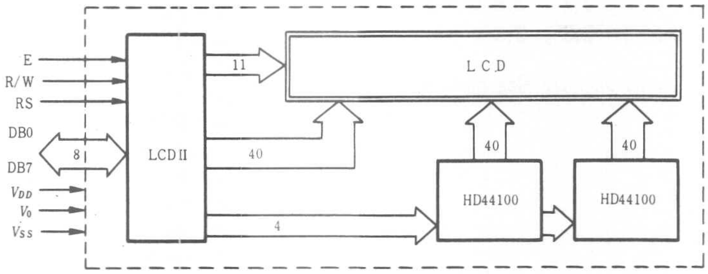
Fig. 1 Display pattern

Unit: mm



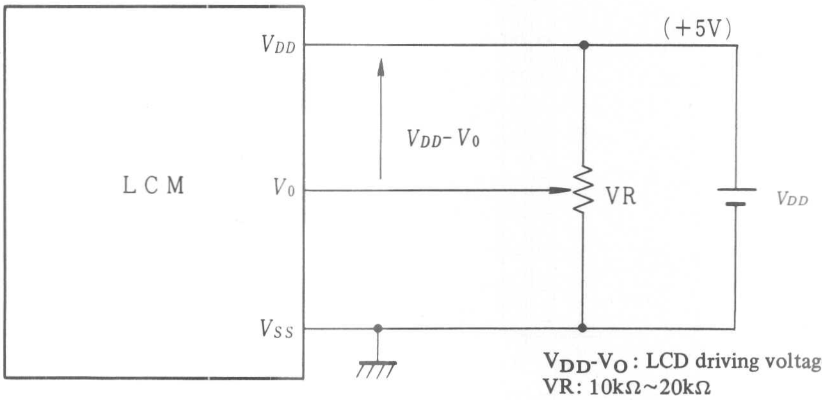
126.0±0.3
2.5±0.3
121.0±0.2
12.6±0.3
110.0±0.3
2.5±0.3
2.54±0.12
14-ϕ1.0±0.1
1 2 3
14
36.0±0.5
31.0±0.2
2.0±0.5
6.6±0.2
8.7±0.1
2.55±0.5
13.8±0.2
27.0±0.3
4.7~5.3
(5.5)
89.4±0.1
4-ϕ2.7±0.2
7.3max
10.5±0.5
5.3±0.5
100.0±0.2
1.6±0.2
12.0max

Fig. 2 External dimensions



E
R/W
RS
DB0
DB7
8
V_{DD}
V_0
V_{SS}
LCD II
11
40
4
LCD
40
40
HD44100
HD44100

Fig. 3 Block diagram



LCM
V_{DD}
V_0
V_{SS}
(+5V)
V_{DD}- V_0
VR
V_{DD}

V_{DD}-V_O : LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

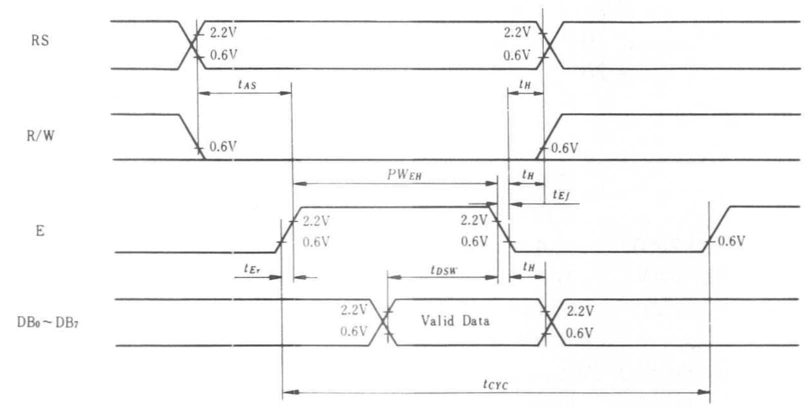

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tcyc

Fig. 5 Interface timing (data write)

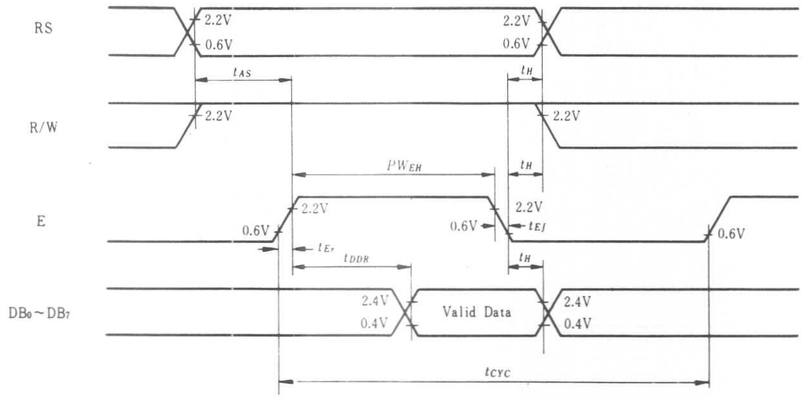

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
2.2V
0.6V
0.6V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tcyc

Fig. 6 Interface timing (data read)

H2571

- 32-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	174.5W x 31.0H x 13.4D (max) mm
Effective display are	132.5W x 14.0H mm
Character size (5 x 10 dots)	3.15W x 7.9H mm
Pitch	3.85 mm
Dot size	0.55W x 0.7H mm
Weight	about 60 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	–20	70°C

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

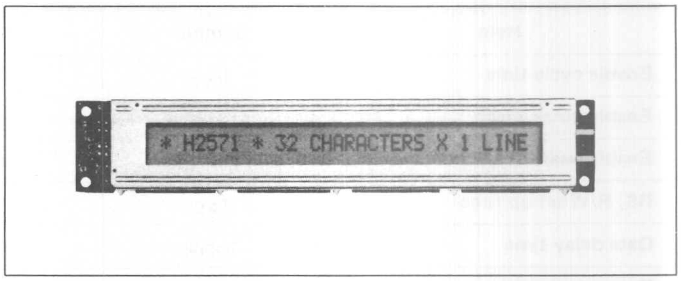
Input "high" voltage (Vi_H)	2.2 V min.
Input "low" voltage (Vi_L)	0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$ = 0.2mA)	2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA)	0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V)	0.5 mA typ. 2.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

	Du=1/8	Du=1/11
at Ta = 0°C	4.0	4.2V typ.
at Ta = 25°C	3.7	3.8V typ.
at Ta = 50°C	3.3	3.3V typ.

OPTICAL DATA

OPTICAL DATA .... See page 6



INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of DB_4~DB_7 and DB_0~DB_3 are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of DB_4~DB_7 when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of DB_0~DB_3 when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of DB_0~DB_7.

Unit: mm

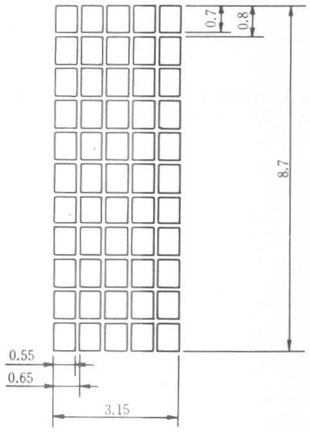


Fig. 1 Display pattern

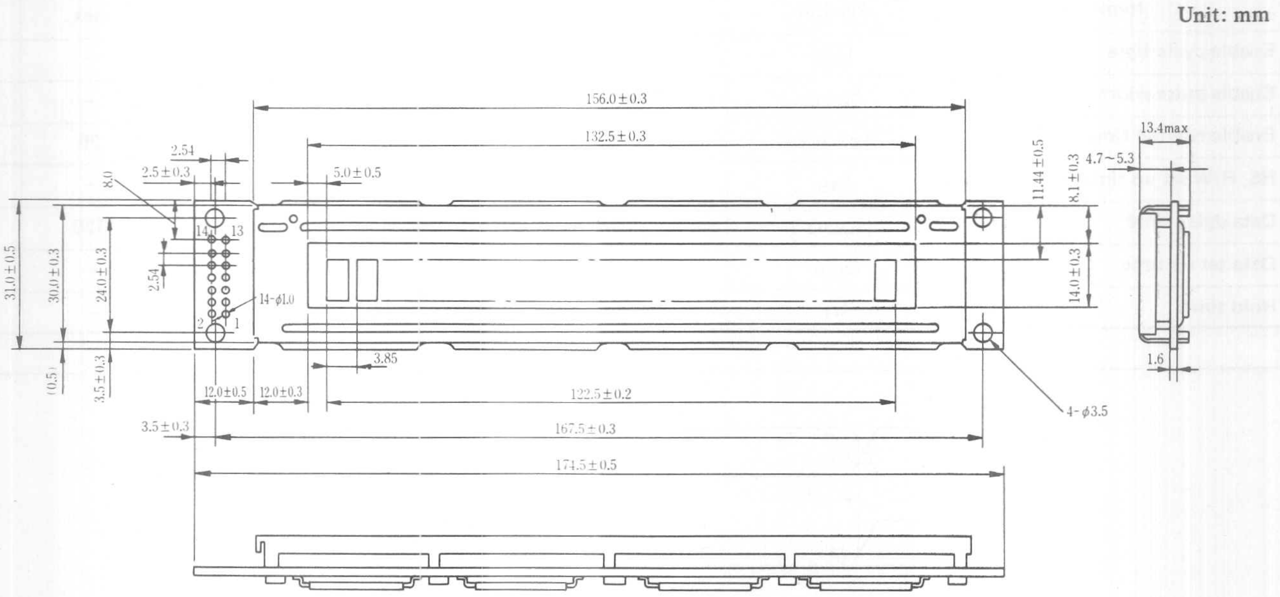

Unit: mm
156.0±0.3
132.5±0.3
2.54
2.5±0.3
8.0
5.0±0.5
14
13
2
1
14-φ1.0
2.54
31.0±0.5
30.0±0.3
24.0±0.3
3.85
(0.5)
3.5±0.3
12.0±0.5
12.0±0.3
122.5±0.2
3.5±0.3
167.5±0.3
174.5±0.5
11.44±0.5
8.1±0.3
14.0±0.3
13.4max
4.7~5.3
1.6
4-φ3.5

Fig. 2 External dimensions

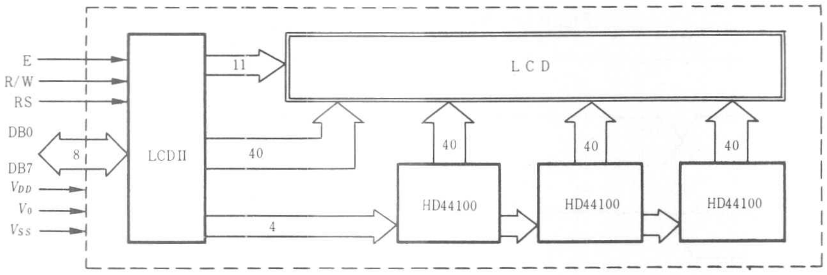
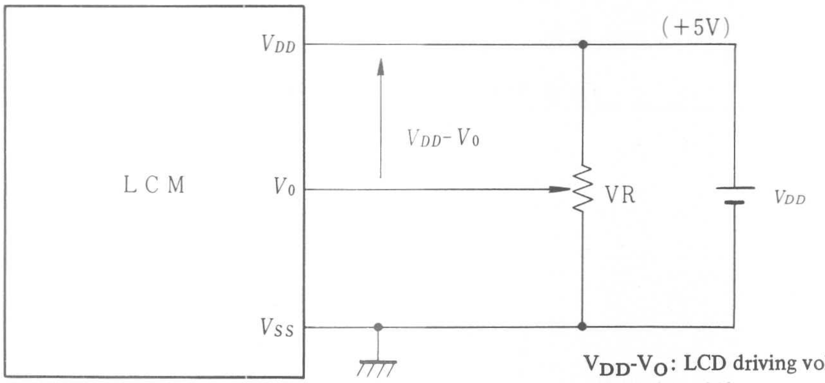

E
R/W
RS
DB0
DB7
8
V_{DD}
V_0
V_{SS}
LCDII
11
40
4
LCD
40
40
40
HD44100
HD44100
HD44100

Fig. 3 Block diagram


LCM
V_{DD}
V_0
V_{SS}
$V_{DD}-V_0$
VR
(+5V)
V_{DD}

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	µs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

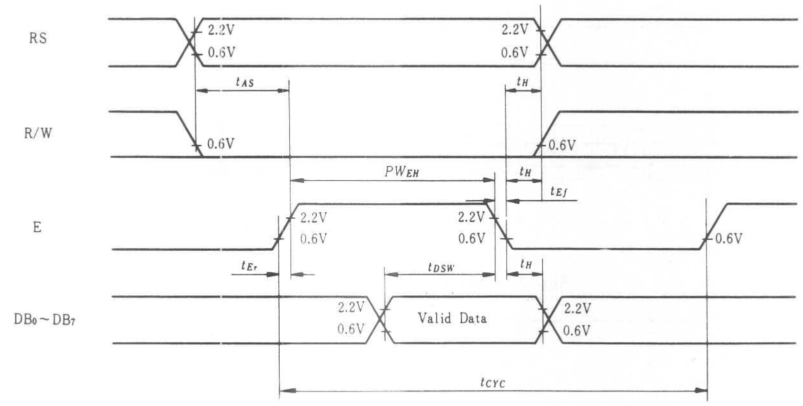

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

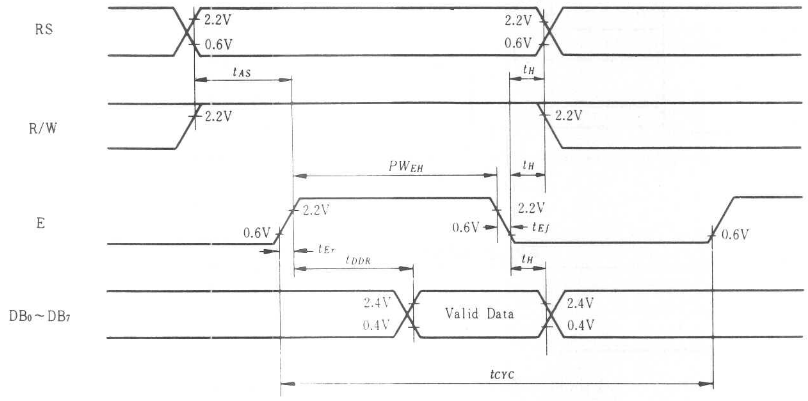

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
0.6V
2.2V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

H2572

- 40-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size .... 182W x 33.5H x 13D (max) mm
Effective display area .... 154.4W x 15.8H mm
Character size (5 x 10 dots)......... 3.15W x 7.9H mm
Pitch .... 3.75 mm
Dot size .... 0.55W x 0.7H mm
Weight .... about 65 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	–20	70°C

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

Input "high" voltage (Vi_H) .... 2.2 V min.
Input "low" voltage (Vi_L) .... 0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$=0.2mA) . . . 2.4 V min.
Output low voltage (V_{OL}) (I_{OL}=1.2mA) . . . . 0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V) . . 0.5 mA typ.
2.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

	Du=1/8	Du=1/11
at Ta = 0°C	4.0	4.2 V typ.
at Ta = 25°C	3.7	3.8 V typ.
at Ta = 50°C	3.3	3.3 V typ.

OPTICAL DATA .... See page 6

** H2572 ** 40 CHARACTERS X 1 LINE_

INTERNAL PIN CONNECTION

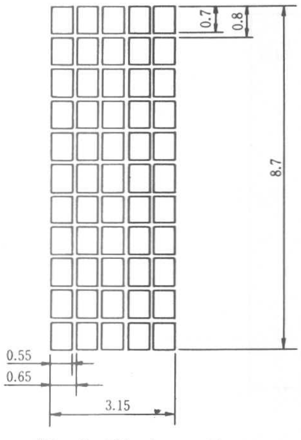
Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.



Unit: mm

Fig. 1 Display pattern

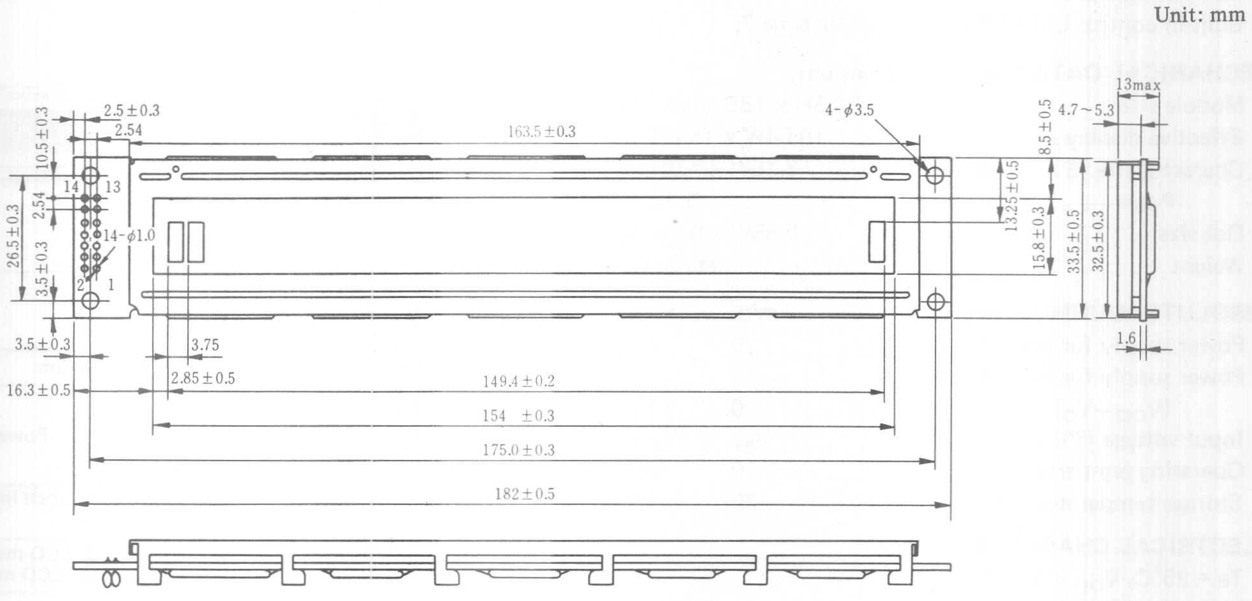

Unit: mm
2.5±0.3
2.54
163.5±0.3
4-φ3.5
13max
4.7~5.3
8.5±0.5
10.5±0.3
14
13
2.54
26.5±0.3
14-φ1.0
3.5±0.3
2
1
13.25±0.5
15.8±0.3
33.5±0.5
32.5±0.3
1.6
3.5±0.3
3.75
16.3±0.5
2.85±0.5
149.4±0.2
154 ±0.3
175.0±0.3
182±0.5

Fig. 2 External dimensions

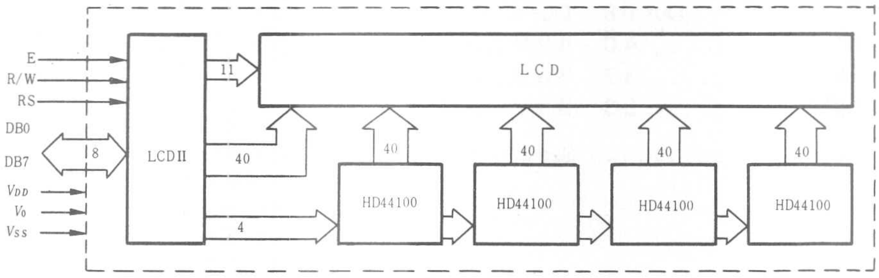

E
R/W
RS
DB0
DB7
V_{DD}
V_0
V_{SS}
8
LCD II
11
40
4
LCD
40
40
40
40
HD44100
HD44100
HD44100
HD44100

Fig. 3 Block diagram

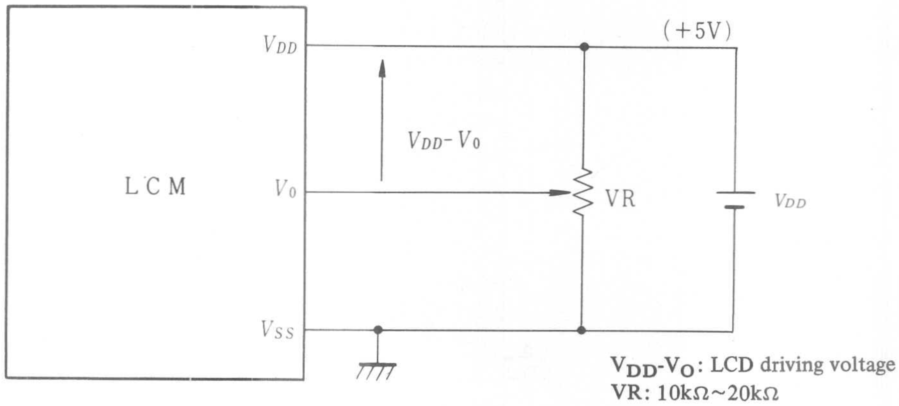

LCM
V_{DD}
V_0
V_{SS}
(+5V)
$V_{DD}-V_0$
VR
V_{DD}
V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	—	—	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	—	—	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	—	—	ns
Data delay time	t_{DDR}	Fig. 6	—	—	320	ns
Data set up time	t_{DSW}	Fig. 5	225	—	—	ns
Hold time	t_H	Fig. 5, Fig. 6	10	—	—	ns

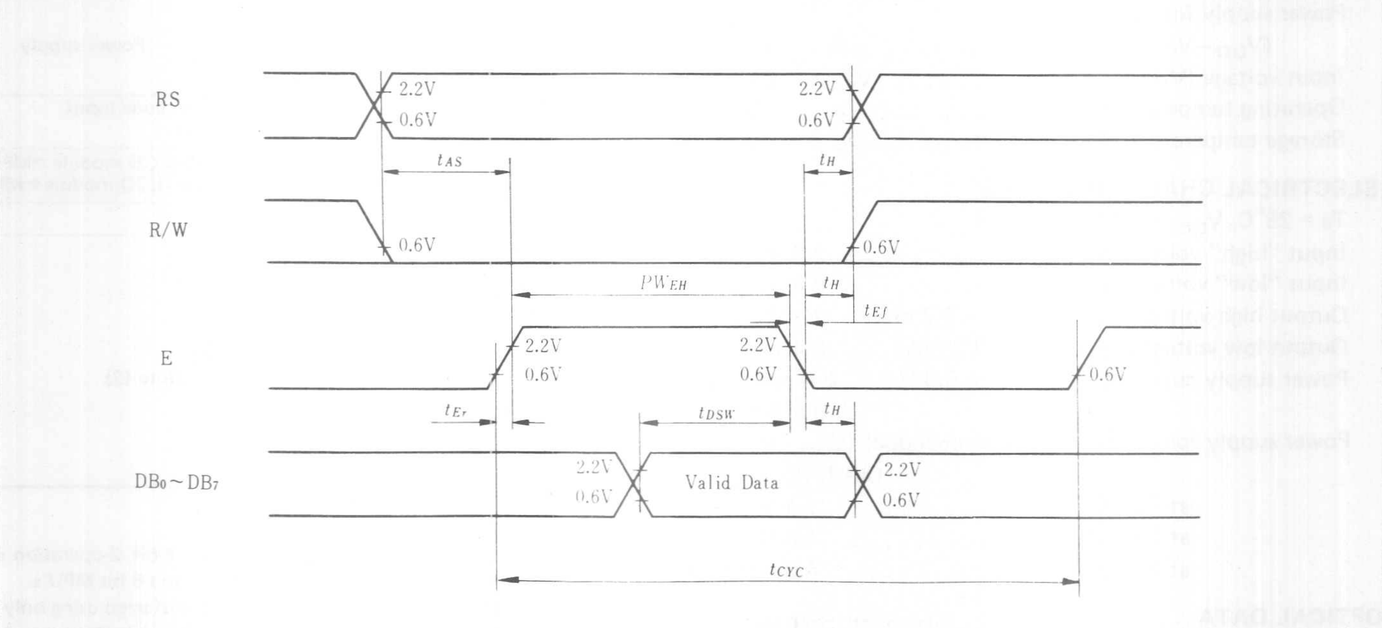

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

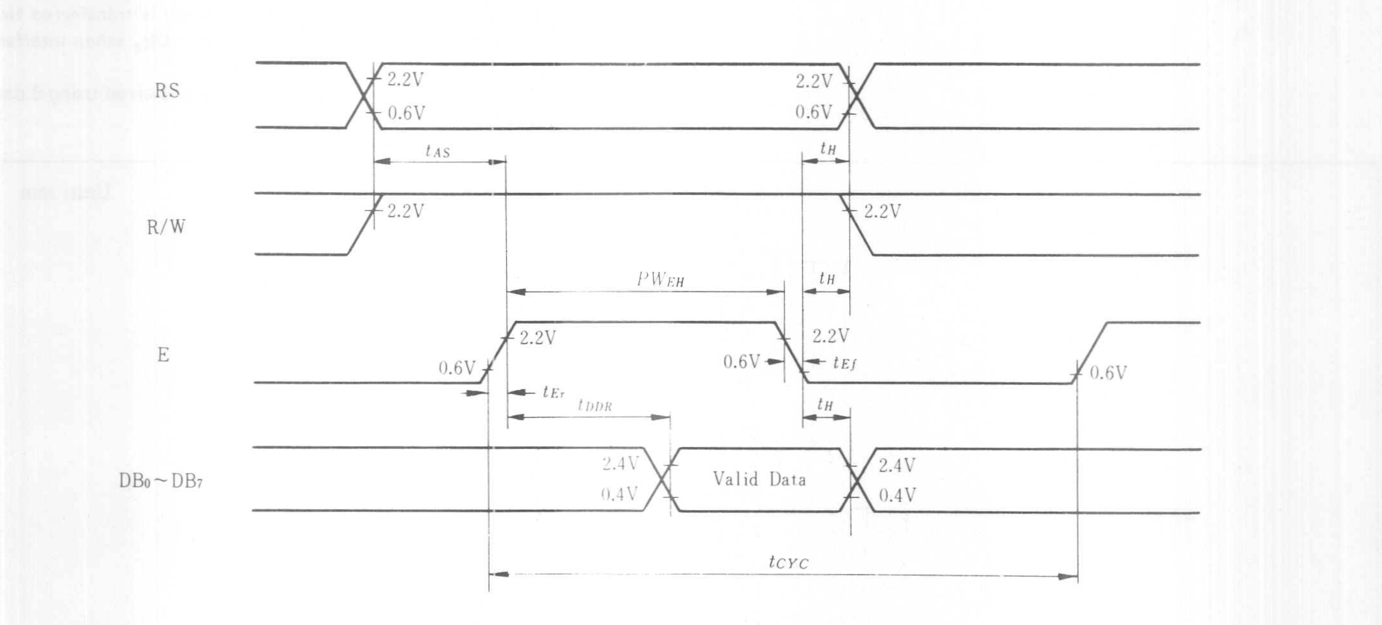

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
0.6V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

LM016

- 32-Position alpha-numeric display.
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	84W x 44H x 15D (max) mm
Effective display area	61W x 15.8H mm
Character size (5 x 7 dots)	2.95W x 4.85H mm
Pitch	3.55 mm
Dot size	0.55W x 0.65H mm
Weight	about 25 g

ABSOLUTE MAXIMUM RATINGS	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (TA)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

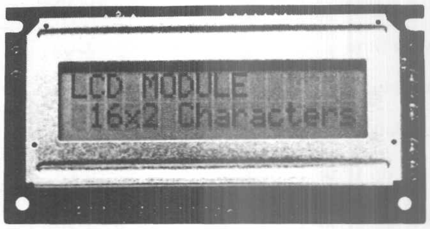
Input "high" voltage (Vi_H)	2.2 V min.
Input "low" voltage (Vi_L)	0.6 Vmax.
Output high voltage (V_{OH}) ($-I_{OH}$ = 0.2 mA)	2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA)	0.4 Vmax.
Power supply current (I_{DD}) (V_{DD} = 5.0 V)	0.5 mA typ. 3.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

Du=1/16

at Ta = 0°C	5.4 V typ.
at Ta = 25°C	4.8 V typ.
at Ta = 50°C	4.0 V typ.

OPTICAL DATA .... See page 6



INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of DB_4~DB_7 and DB_0~DB_3 are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of DB_4~DB_7 when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of DB_0~DB_3 when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of DB_0~DB_7.

Unit: mm

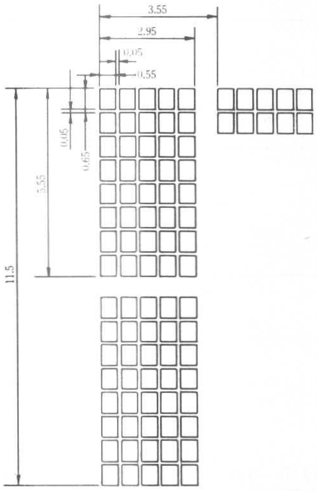
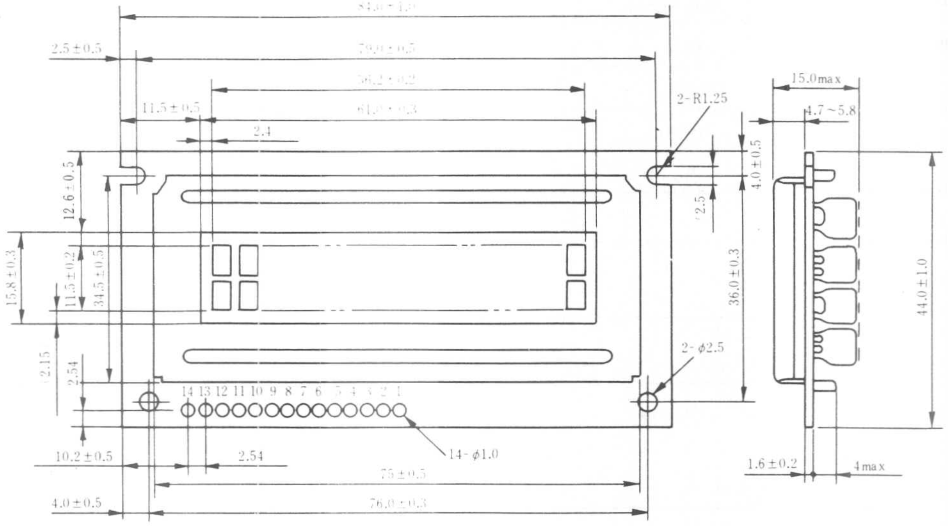


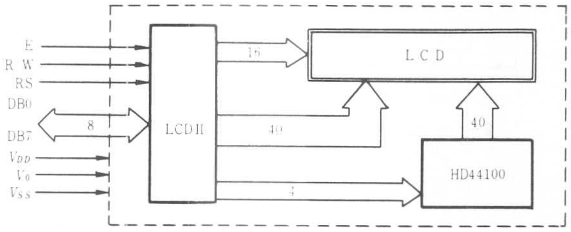
Fig. 1 Display pattern

Unit: mm



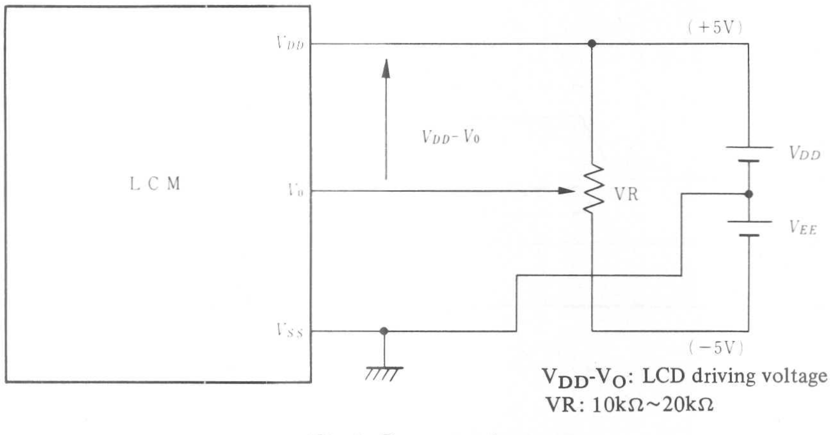
84.0±1.0
2.5±0.5
79.0±0.5
56.2±0.2
11.5±0.5
61.0±0.3
2.4
2-R1.25
15.0max
4.7~5.8
4.0±0.5
2.5
12.6±0.5
15.8±0.3
11.5±0.2
34.5±0.5
36.0±0.3
44.0±1.0
2.15
2.54
2-ϕ2.5
14 13 12 11 10 9 8 7 6 5 4 3 2 1
14-ϕ1.0
10.2±0.5
2.54
75±0.5
4.0±0.5
76.0±0.3
1.6±0.2
4max

Fig. 2 External dimensions



E
R W
RS
DB0
DB7
V_{DD}
V_0
V_{SS}
8
LCDII
16
LCD
40
40
HD44100
3

Fig. 3 Block diagram



LCM
V_{DD}
V_0
V_{SS}
(+5V)
$V_{DD}-V_0$
VR
V_{DD}
V_{EE}
(−5V)

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

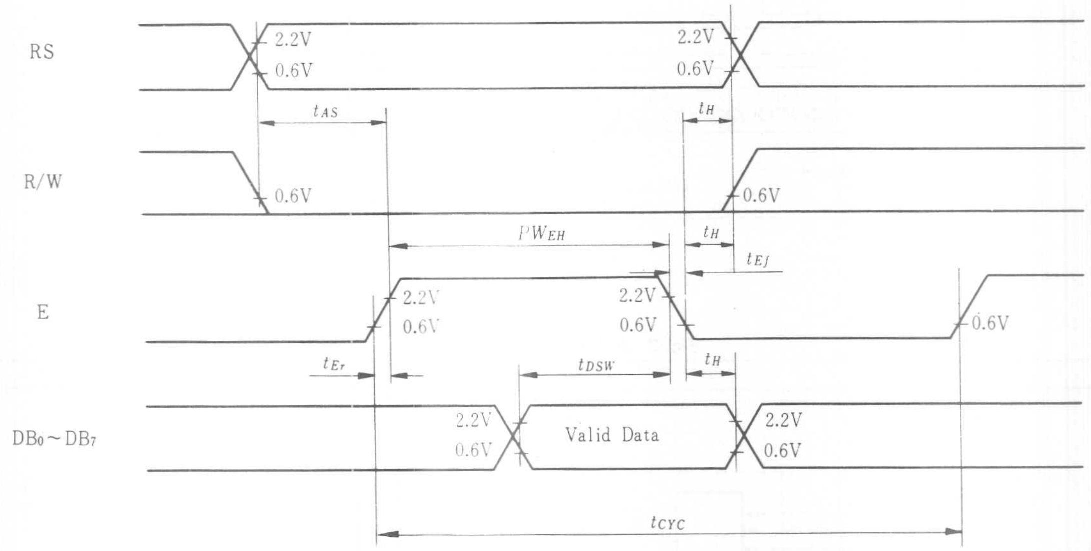

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

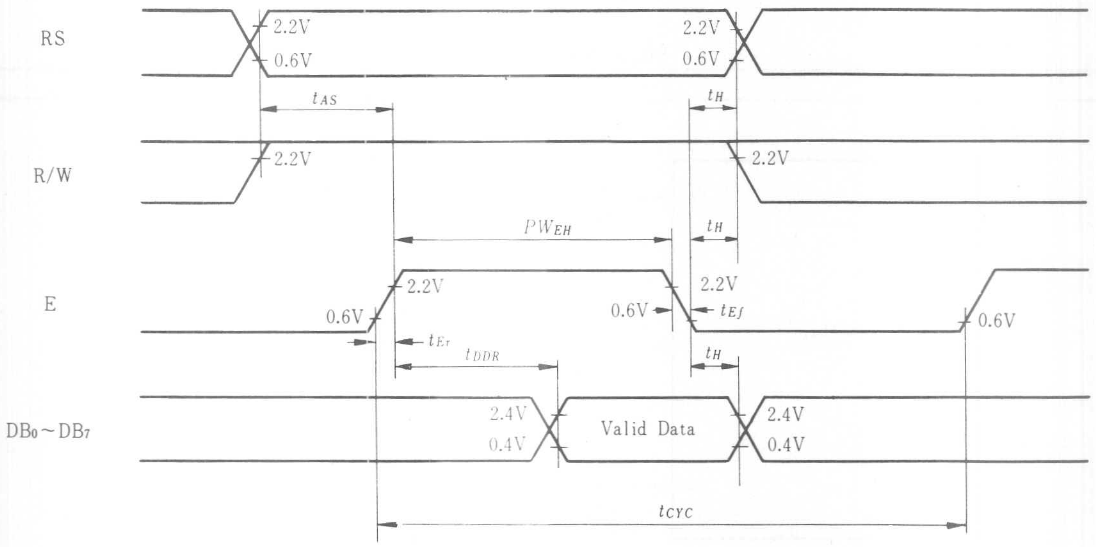

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
0.6V
2.2V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

LM032

- 40-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	116W x 37H (max) x 13D (max) mm
Effective display area	83W x 18.6H mm
Character size (5 x 7 dots)	3.2W x 4.85H mm
Pitch	3.7 mm
Dot size	0.6W x 0.65H mm
Weight	about 50 g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0 V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5 V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0 V ± 0.25 V

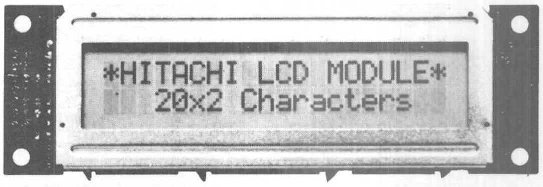
Input "high" voltage (Vi_H)	2.2 V min.
Input "low" voltage (Vi_L)	0.6 V max.
Output high voltage (V_{OH}) ($-I_{OH}$ = 0.2 mA)	2.4 V min.
Output low voltage (V_{OL}) (I_{OL} = 1.2 mA)	0.4 V max.
Power supply current (I_{DD}) (V_{DD} = 5.0 V)	0.5 mA typ. 3.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

Du=1/16

at Ta = 0°C	5.5 V typ.
at Ta = 25°C	5.0 V typ.
at Ta = 50°C	4.0 V typ.

OPTICAL DATA . . . . See page 6



INTERNAL PIN CONNECTION

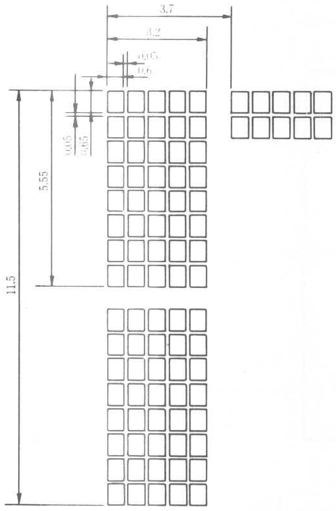
Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.



Unit: mm

Fig. 1 Display pattern

Unit: mm

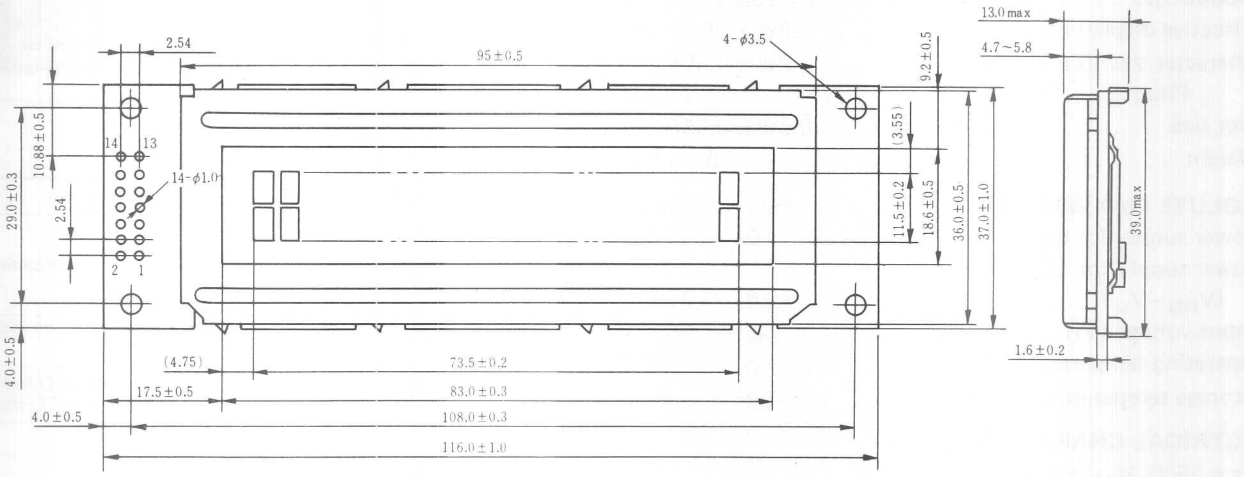

2.54
95±0.5
4-φ3.5
13.0max
4.7~5.8
9.2±0.5
10.88±0.5
29.0±0.3
2.54
14
13
14-φ1.0
2
1
(3.55)
11.5±0.2
18.6±0.5
36.0±0.5
37.0±1.0
39.0max
1.6±0.2
4.0±0.5
(4.75)
73.5±0.2
17.5±0.5
83.0±0.3
4.0±0.5
108.0±0.3
116.0±1.0

Fig. 2 External dimensions

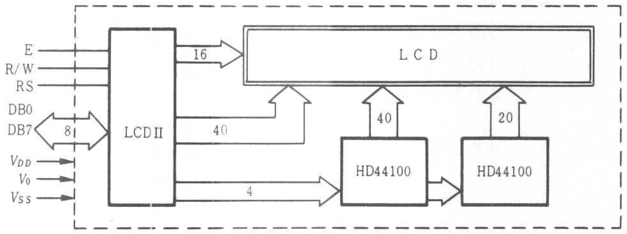
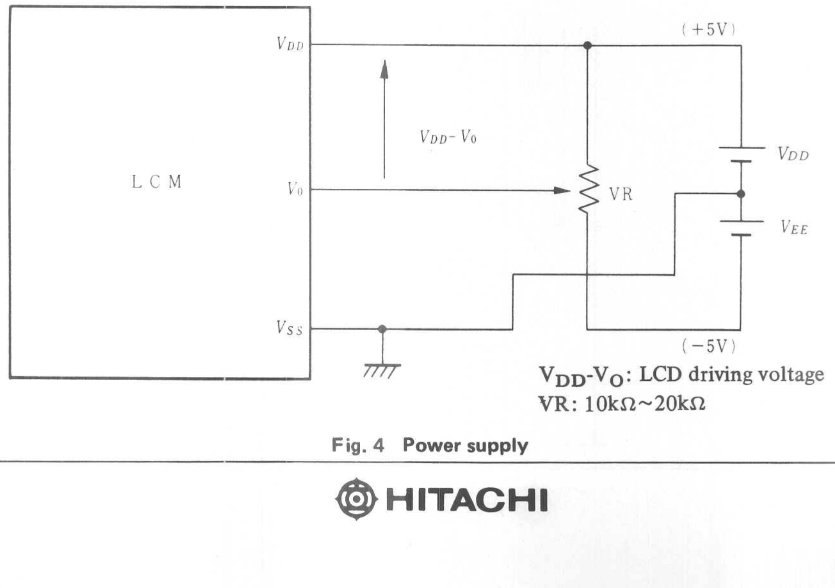

E
R/W
RS
DB0
DB7
8
V_{DD}
V_0
V_{SS}
LCDII
16
LCD
40
40
20
HD44100
HD44100
4

Fig. 3 Block diagram


V_{DD}
(+5V)
V_{DD}-V_0
LCM
V_0
VR
V_{DD}
V_{EE}
V_{SS}
(−5V)

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	—	—	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	—	—	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	—	—	ns
Data delay time	t_{DDR}	Fig. 6	—	—	320	ns
Data set up time	t_{DSW}	Fig. 5	225	—	—	ns
Hold time	t_H	Fig. 5, Fig. 6	10	—	—	ns

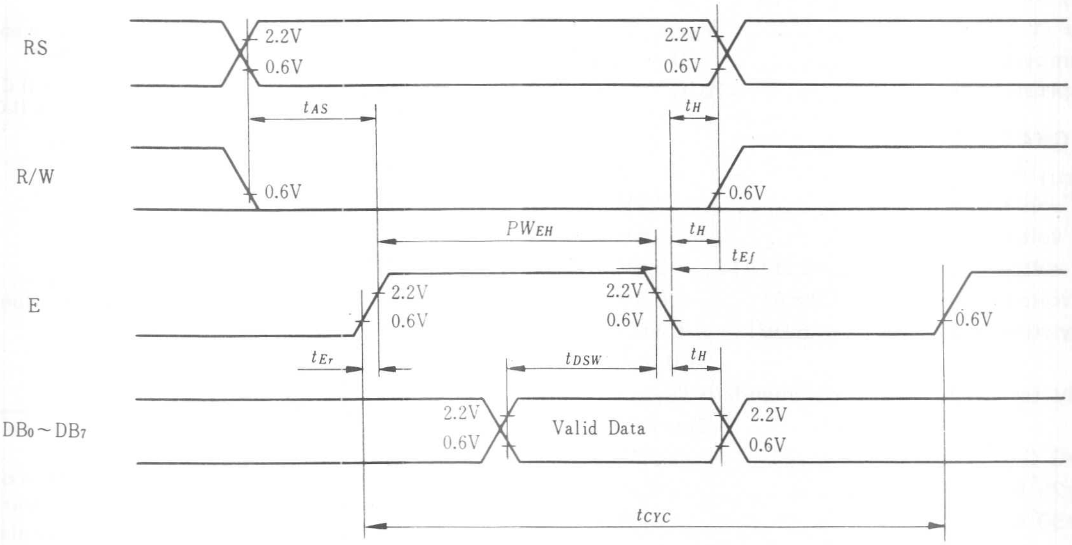

RS
R/W
E
DB₀~DB₇
2.2V
0.6V
tAS
tH
PWEH
tEf
tEr
tDSW
Valid Data
tCYC

Fig. 5 Interface timing (data write)

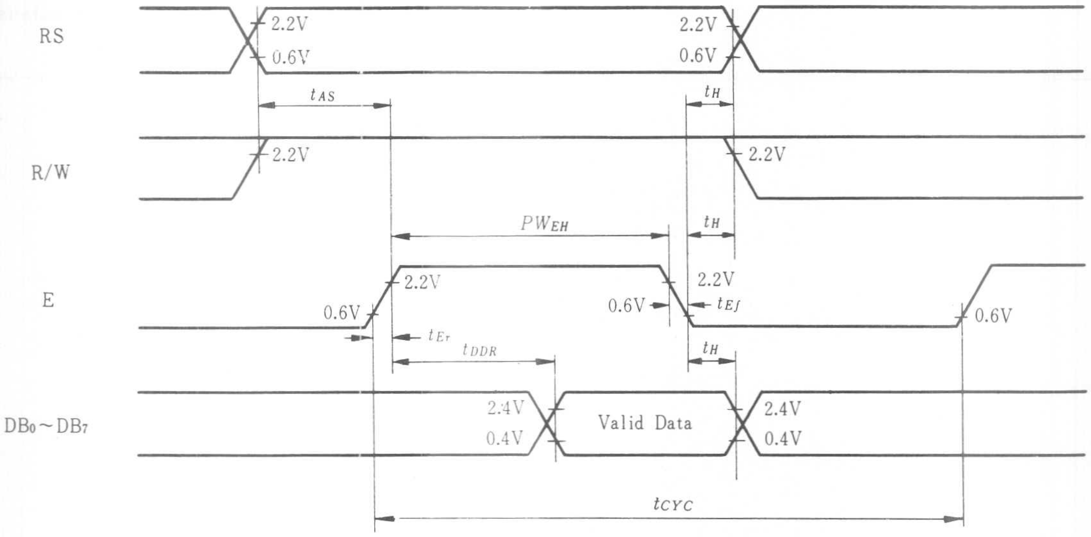

RS
R/W
E
DB₀~DB₇
2.2V
0.6V
2.4V
0.4V
tAS
tH
PWEH
tEf
tEr
tDDR
Valid Data
tCYC

Fig. 6 Interface timing (data read)

LM017

- 64-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	174.5W x 31H x 13.4D(max) mm
Effective display area	141.19W x 16.75H mm
Character size (5 x 7 dots)	3.45W x 4.85H mm
Pitch	4.2 mm
Dot size	0.65W x 0.65H mm
Weight	about 60g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD} - V_{SS}$)	0	7.0V
power supply for LCD drive ($V_{DD} - V_O$)	0	13.5V
Input voltage (Vi)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20°C	70°C

ELECTRICAL CHARACTRISTICS

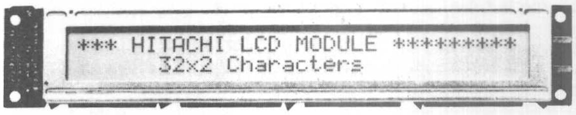
Ta=25°C, V_{DD}=5.0V ±0.25V

Input "high" voltage (V_{iH})	2.2V min.
Input "low" voltage (V_{iL})	0.6V max.
Output high voltage (V_{OH}) ($-I_{OH}$=0.2mA)	2.4V min.
Output low voltage (V_{OL}) (I_{OL}=1.2mA)	0.4V min.
Power supply current (I_{DD}) (V_{DD}=5.0V)	0.5mA typ. 3.0 mA max.

Power supply for LCD drive (Recommended) ($V_{DD} - V_O$)
Du=1/16

at Ta=0°C	5.4V typ.
at Ta=25°C	4.8V typ.
at Ta=50°C	4.0V typ.

OPTICAL DATA ....See page 6



INTERNAL PIN CONNECTION

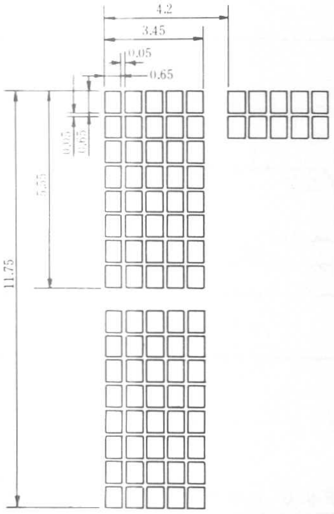
Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.



Unit: mm

Fig. 1 Display pattern

Unit: mm

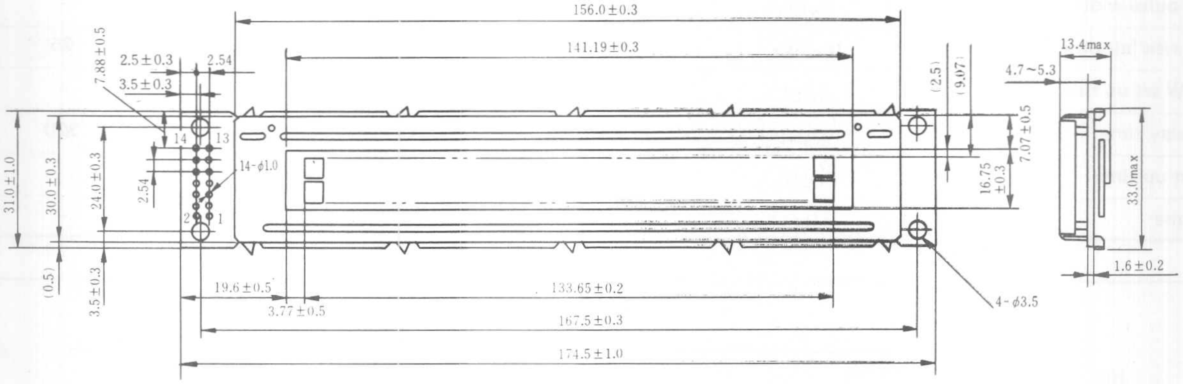

156.0±0.3
141.19±0.3
7.88±0.5
2.5±0.3
2.54
3.5±0.3
14
13
2
1
14-φ1.0
2.54
31.0±1.0
30.0±0.3
24.0±0.3
(0.5)
3.5±0.3
19.6±0.5
3.77±0.5
133.65±0.2
167.5±0.3
174.5±1.0
4-φ3.5
(2.5)
(9.07)
16.75 ±0.3
7.07±0.5
4.7~5.3
13.4max
33.0max
1.6±0.2

Fig. 2 External dimensions

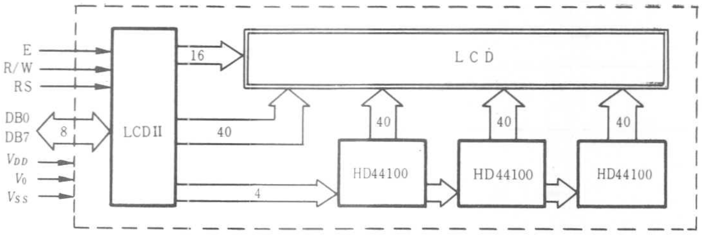
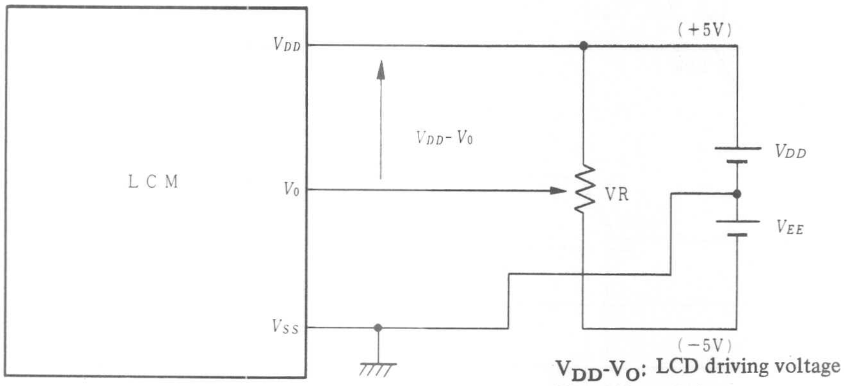

E
R/W
RS
DB0
DB7
8
V_DD
V_0
V_SS
LCD II
16
40
4
LCD
40
40
40
HD44100
HD44100
HD44100

Fig. 3 Block diagram


LCM
V_DD
V_0
V_SS
V_DD-V_0
VR
(+5V)
V_DD
V_EE
(−5V)

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

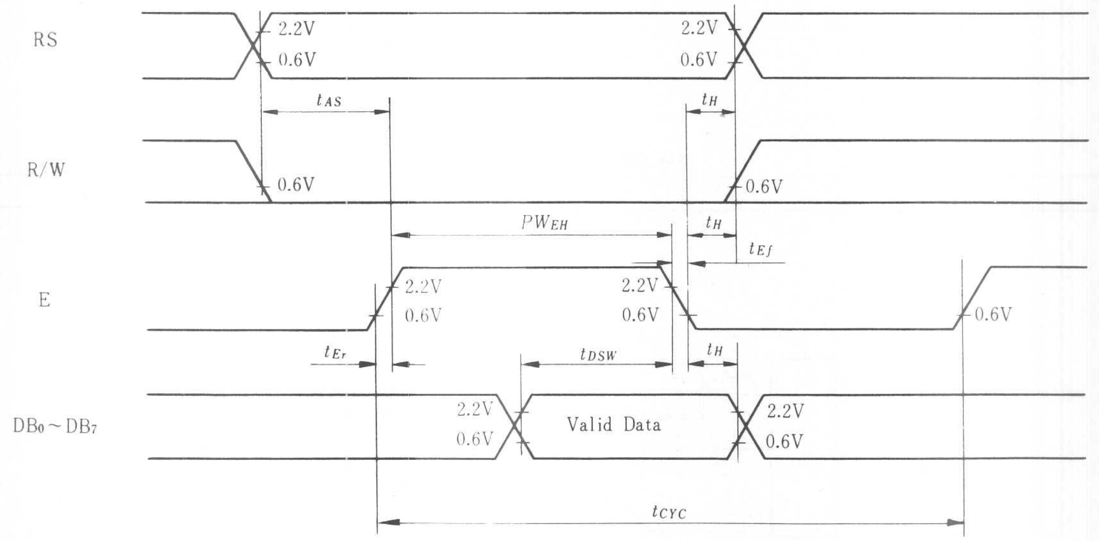

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0 ~ DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

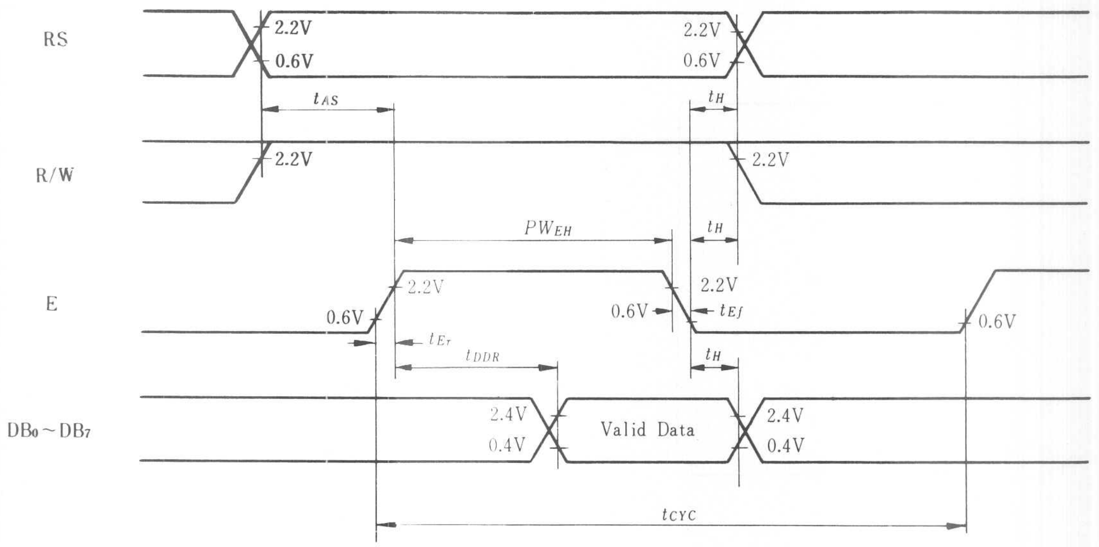

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
0.6V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0 ~ DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

LM018

- 80-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	182W x 33.5H x 13D (max) mm
Effective display area	154.4W x 15.8H mm
Character size (5 x 7 dots)	3.2W x 4.85H mm
Pitch	3.7 mm
Dot size	0.6W x 0.65H mm
Weight	about 65g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5V
Input voltage (V_i)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTRISTICS

Ta=25°C, V_{DD}=5.0V ±0.25V

Input "high" voltage (V_{iH})	2.2V min.
Input "low" voltage (V_{iL})	0.6V max.
Output high voltage (V_{OH}) ($-I_{OH}$=0.2mA)	2.4V min.
Output low voltage (V_{OL}) (I_{OL}=1.2mA)	0.4V max.
Power supply current (I_{DD}) (V_{DD}=5.0V)	0.5mA typ. 3.0mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)
Du=1/16

at Ta=0°C	5.4V typ.
at Ta=25°C	5.0V typ.
at Ta=50°C	4.0V typ.

OPTICAL DATA .... See page 6

**** HITACHI DOT MATRIX LCD MODULE *****
40x2 Characters

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	−	0V	Power supply
2	V_{DD}	−	5V	
3	V_O	−	−	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:
In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4\sim DB_7$ and $DB_0\sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4\sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0\sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0\sim DB_7$.

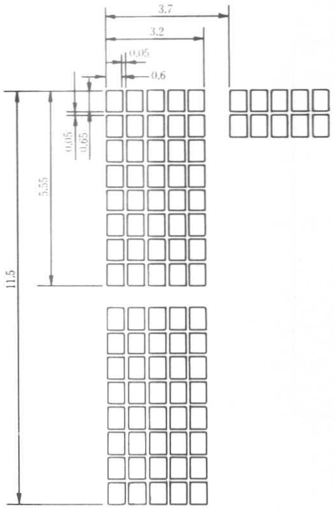


Fig. 1 Display pattern

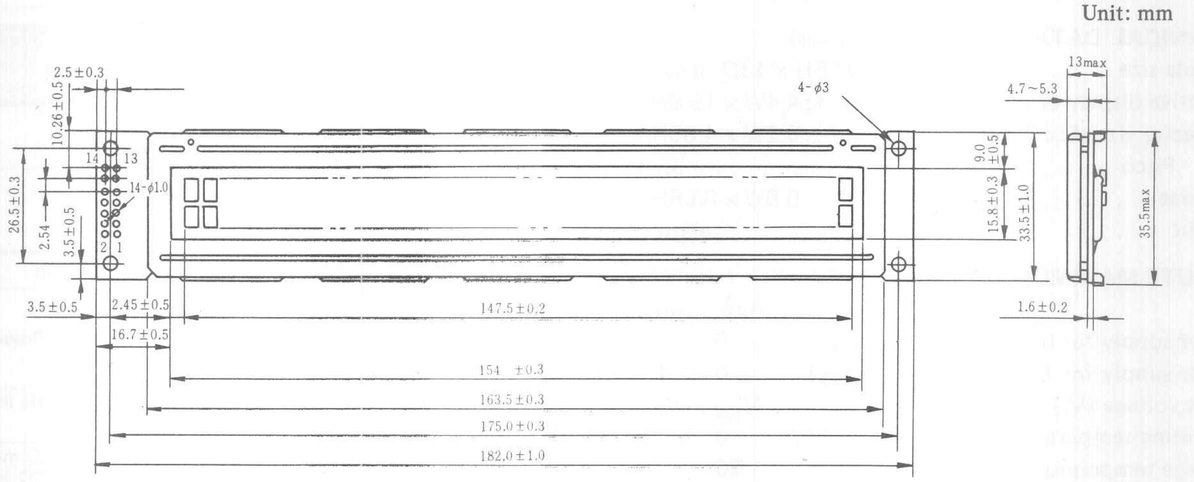

Unit: mm
2.5±0.3
10.26±0.5
26.5±0.3
2.54
3.5±0.5
14
13
2
1
14-φ1.0
4-φ3
3.5±0.5
2.45±0.5
16.7±0.5
147.5±0.2
154 ±0.3
163.5±0.3
175.0±0.3
182.0±1.0
9.0±0.5
15.8±0.3
33.5±1.0
35.5max
13max
4.7~5.3
1.6±0.2

Fig. 2 External dimensions

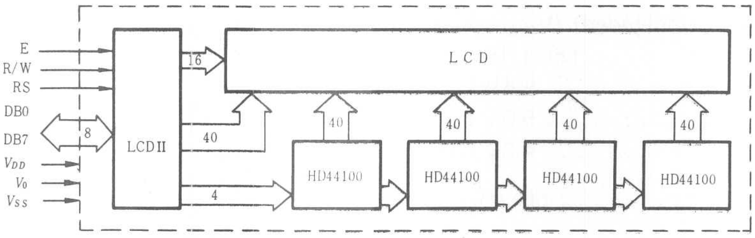
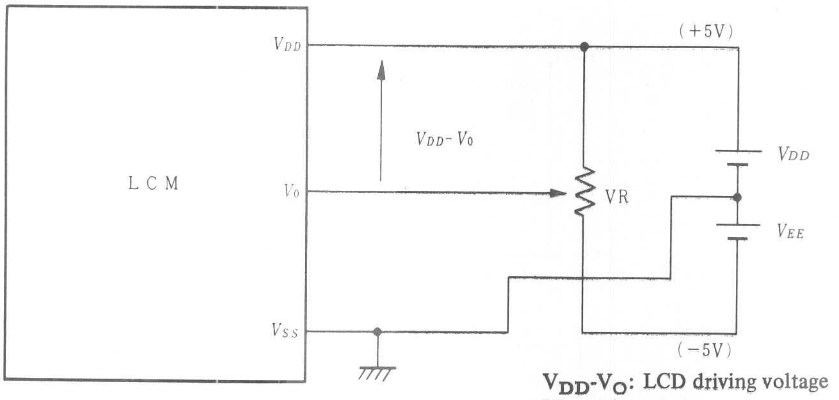

E
R/W
RS
DB0
DB7
V_{DD}
V_0
V_{SS}
8
LCDII
16
40
4
LCD
40
40
40
40
HD44100
HD44100
HD44100
HD44100

Fig. 3 Block diagram


LCM
V_{DD}
V_0
V_{SS}
$V_{DD}-V_0$
(+5V)
(−5V)
VR
V_{DD}
V_{EE}

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

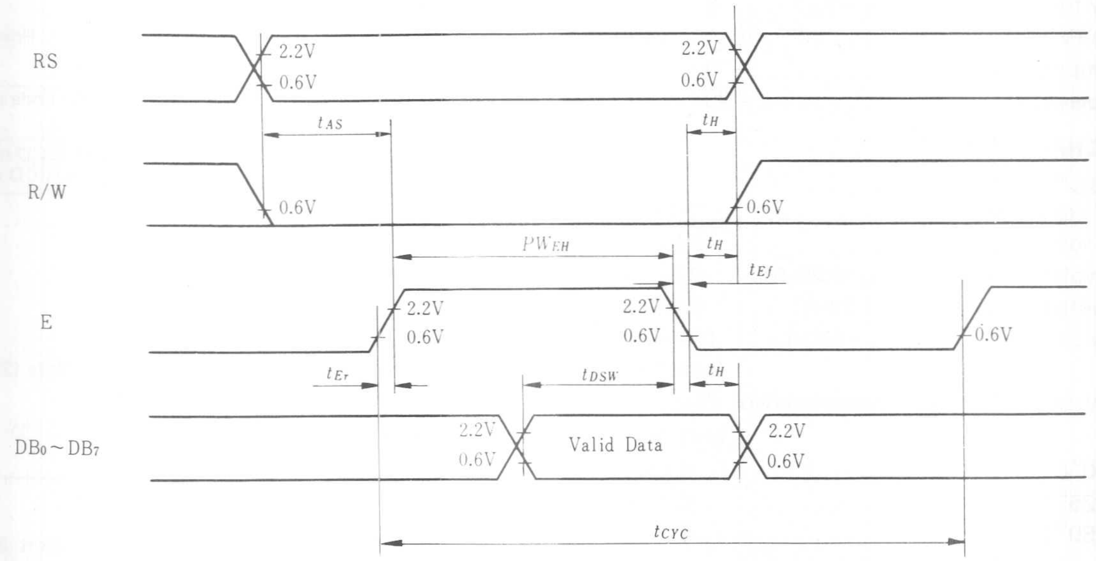

RS
R/W
E
DB0 ~ DB7
2.2V
0.6V
tAS
tH
PWEH
tEf
tEr
tDSW
Valid Data
tCYC

Fig. 5 Interface timing (data write)

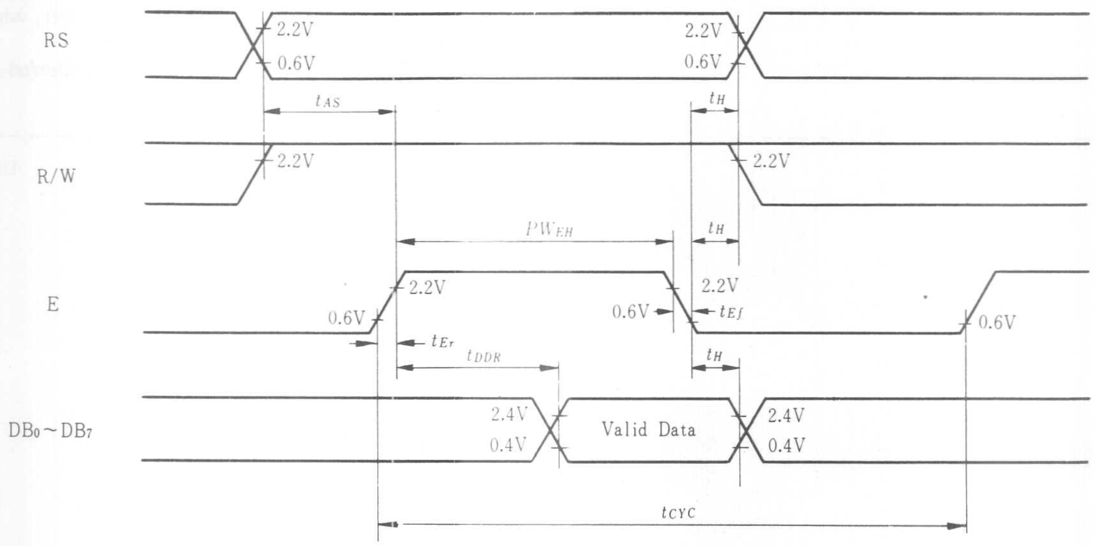

RS
R/W
E
DB0 ~ DB7
2.2V
0.6V
2.4V
0.4V
tAS
tH
PWEH
tEf
tEr
tDDR
Valid Data
tCYC

Fig. 6 Interface timing (data read)

LM041

- 64-Position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	87W x 60H x 14D (max) mm
Effective display area	61.8W x 25.2H mm
Character size (5 x 7 dots)	2.95W x 4.15H mm
Pitch	3.55 mm
Dot size	0.55W x 0.55H mm
Weight	about 60g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5V
Input voltage (V_i)	V_{SS}	V_{DD} V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	70°C

ELECTRICAL CHARACTRISTICS

Ta=25°C, V_{DD}=5.0V±0.25V

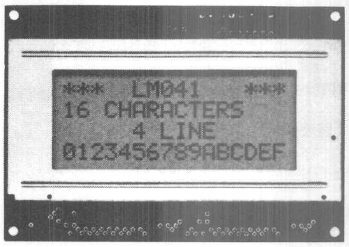
Input "high" voltage (V_{iH})	2.2V min.
Input "low" voltage (V_{iL})	0.6V max.
Output high voltage (V_{OH}) ($-I_{OH}$=0.2mA)	0.6V max.
Output low voltage (V_{OL}) (I_{OL}=1.2mA)	0.4V max.
Power supply current (I_{DD}) (V_{DD}=5.0V)	0.5mA typ. 3.0mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)

Du=1/16

at Ta=0°C	5.5V typ.
at Ta=25°C	5.0V typ.
at Ta=50°C	4.0V typ.

OPTICAL DATA .... See page 6



INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function	
1	V_{SS}	–	0V	Power supply
2	V_{DD}	–	5V	
3	V_O	–	–	
4	RS	H/L	L: Instruction code input H: Data input	
5	R/W	H/L	H: Data read (LCD module→MPU) L: Data write (LCD module←MPU)	
6	E	H, H→L	Enable signal	
7	DB0	H/L	Data bus line Note (1), Note (2)	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1-operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \sim DB_7$ and $DB_0 \sim DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \sim DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \sim DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \sim DB_7$.

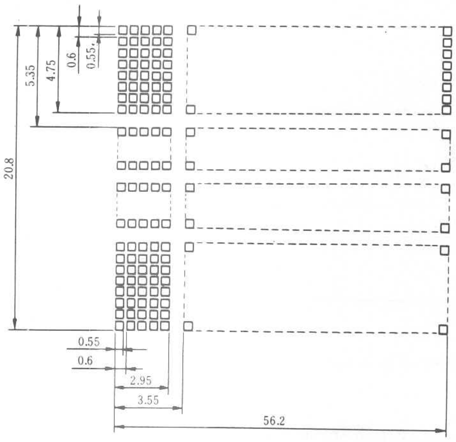


Fig. 1 Display pattern

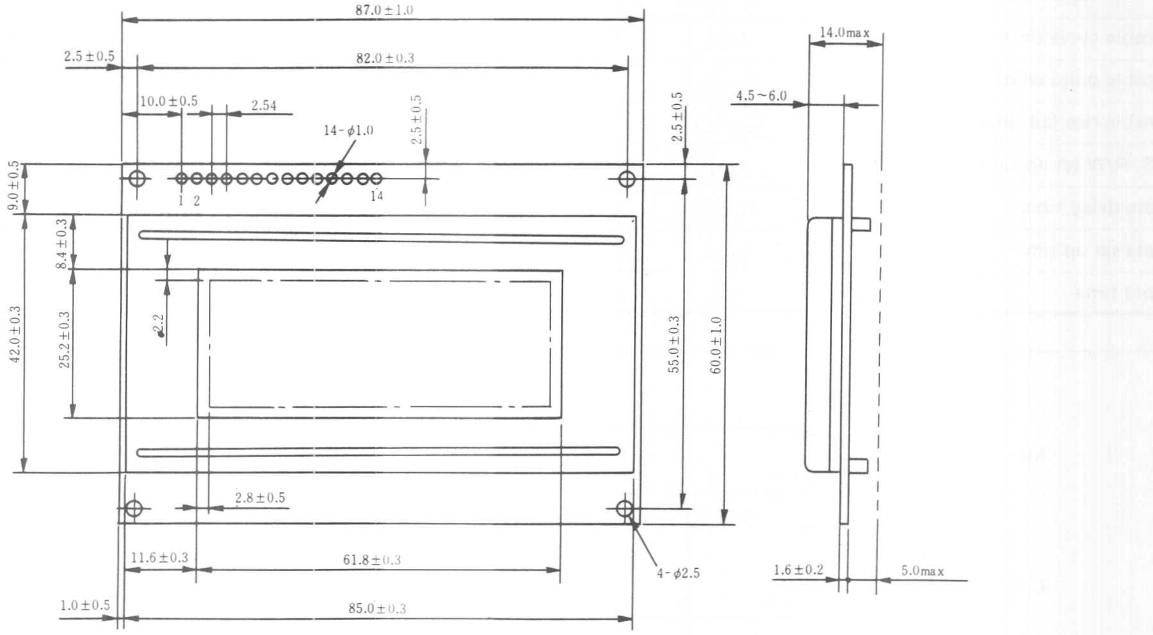

Unit: mm
87.0±1.0
2.5±0.5
82.0±0.3
10.0±0.5
2.54
14-φ1.0
2.5±0.5
2.5±0.5
14.0max
4.5~6.0
9.0±0.5
1 2
14
8.4±0.3
2.2
42.0±0.3
25.2±0.3
55.0±0.3
60.0±1.0
2.8±0.5
11.6±0.3
61.8±0.3
4-φ2.5
1.6±0.2
5.0max
1.0±0.5
85.0±0.3

Fig. 2 External dimensions

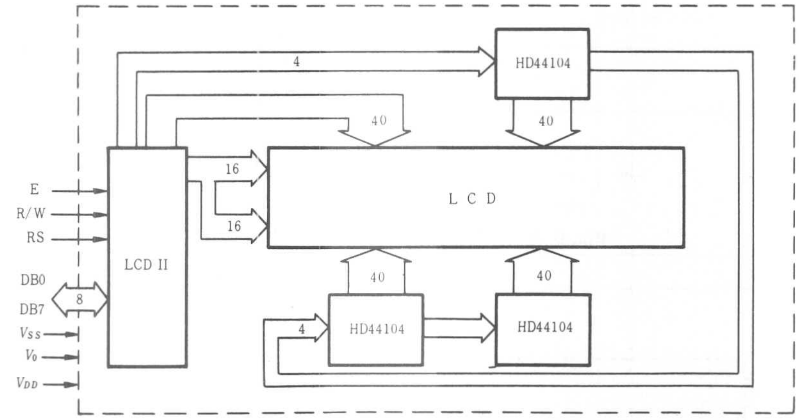
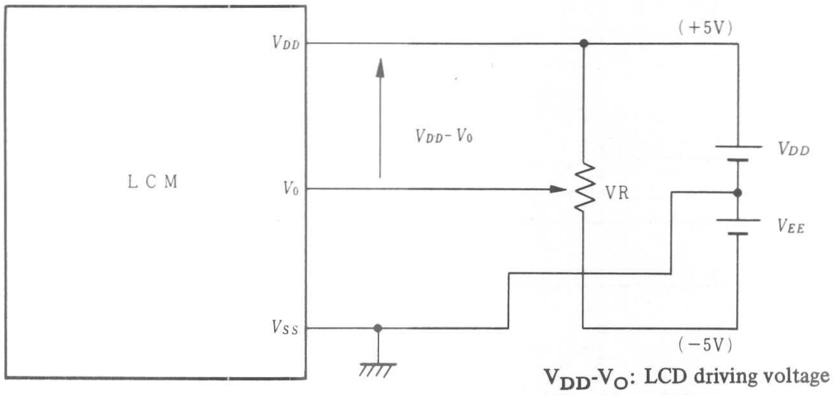

HD44104
4
40
40
E
R/W
RS
16
16
L C D
LCD II
DB0
DB7
8
Vss
V0
VDD
40
40
4
HD44104
HD44104

Fig. 3 Block diagram


LCM
VDD
V0
Vss
VDD- V0
(+5V)
VR
VDD
VEE
(−5V)

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	µs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

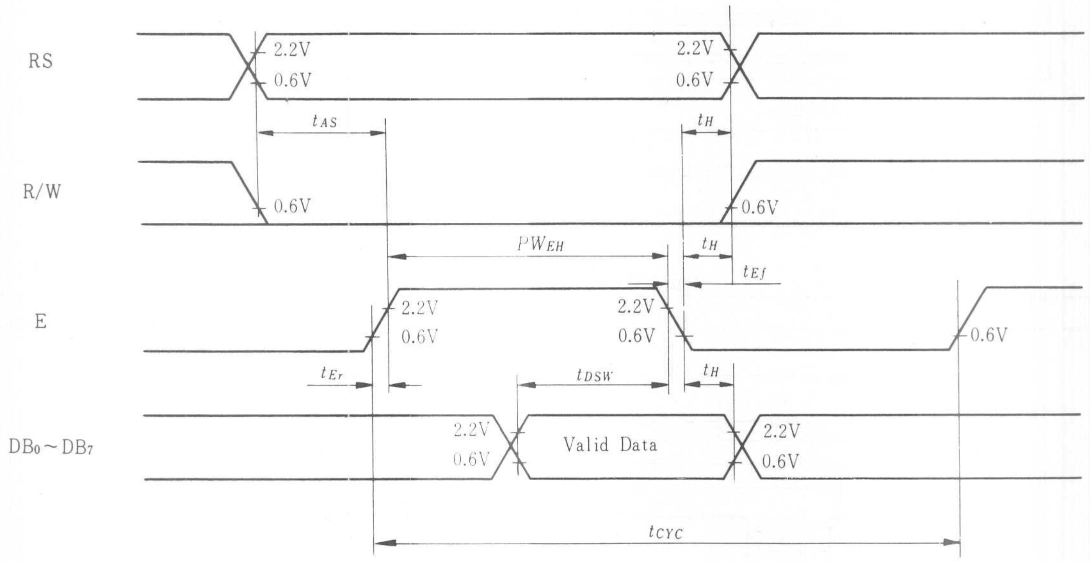

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

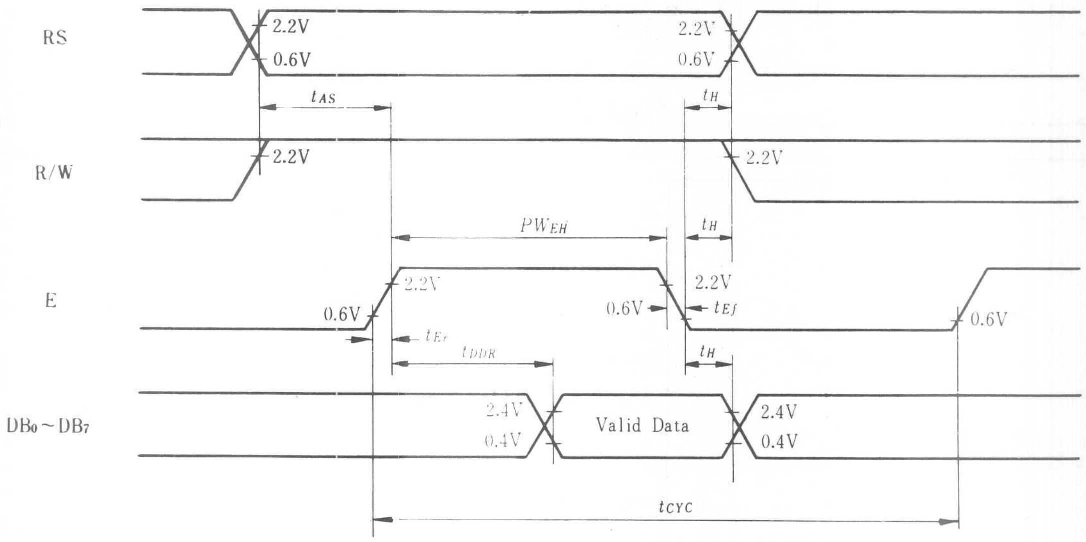
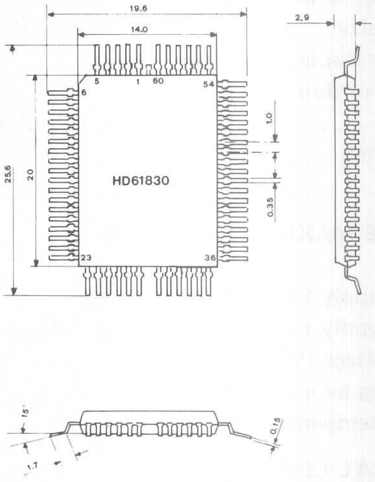

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
0.6V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

GRAPHIC LCD MODULE

HD 61830 Graphic LCD Controller


19.6
14.0
2.9
5
1
60
54
6
HD61830
25.6
20
1.0
0.35
23
36
15°
0.15
1.7

- Display Controller and Character Generator for Liquid Crystal Dot Matrix Graphic Display Systems

The HD61830 receives the display data from a microcomputer and stores them in an external RAM. It converts these data into the serial display pattern, and transfers them to the LCD drivers.

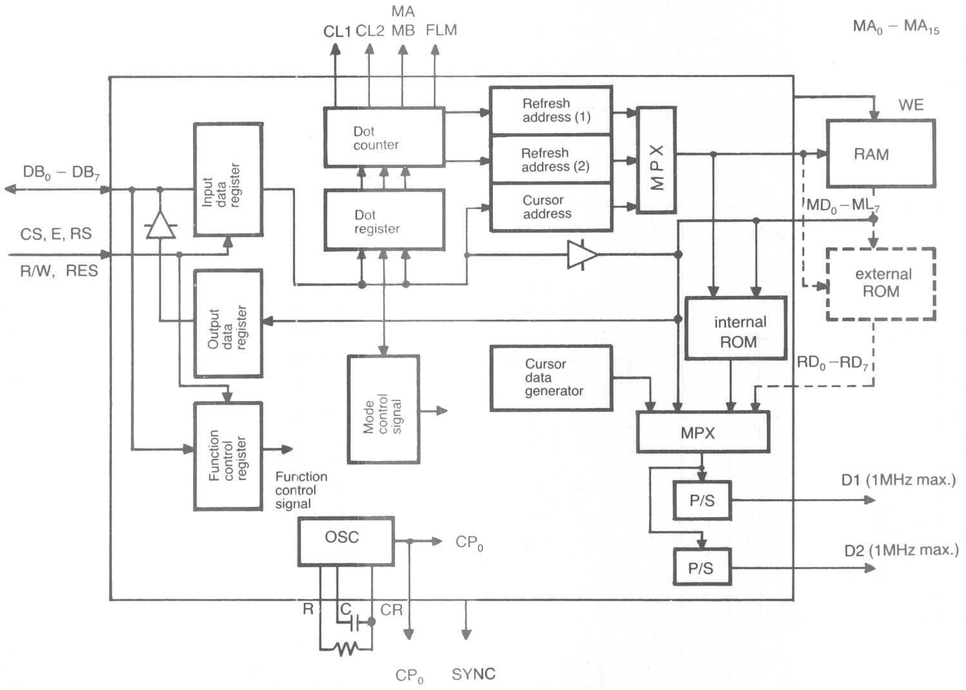
Two kinds of display modes are available:

The Semi-Graphic mode and the Full-Graphic mode.

FEATURES

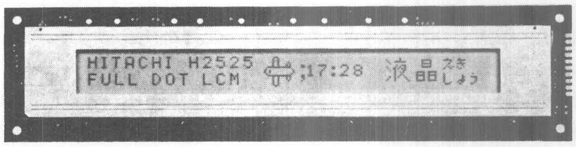
- Full-Graphic mode with 512,000 dots
- Semi-Graphic mode with 192 characters by the internal character generator ROM, plus 4,000 characters by an external ROM
- Display Duty of 1/128 min.
- Other functions controlled by the microcomputer
  Scroll
  Cursor ON/OFF/Blink
  Display Clear
- 60-pin flat plastic package
- Single 5V power supply
- TTL compatible inputs and outputs

BLOCK DIAGRAM


MA
CL1 CL2 MB FLM
$MA_0 - MA_{15}$
WE
Refresh address (1)
Refresh address (2)
Cursor address
MPX
RAM
Dot counter
Dot register
$DB_0 - DB_7$
CS, E, RS
R/W, RES
Input data register
Output data register
Function control register
Function control signal
Mode control signal
$MD_0 - ML_7$
external ROM
internal ROM
$RD_0 - RD_7$
Cursor data generator
MPX
P/S
P/S
D1 (1MHz max.)
D2 (1MHz max.)
OSC
CP_0
R
C
CR
CP_0
SYNC

H2525

- 239dot (W) x 20 dot (H) graphic and alpha-numeric display
- Control LSI HD61830 attachment type


HITACHI H2525
FULL DOT LCM
17:28
液晶

MECHANICAL DATA (Nominal dimensions)

Module size	220W x 53H x 15D (max) mm
Effective display area	163W x 17H mm
Number of dots	239W x 20H dot
Dot size	0.55W x 0.55H mm
Pitch	0.65W x 0.65H mm
Weight	about 100g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_{EE}$)	0	13.5V
Input voltage (V_i)	V_{SS}	V_{DD}V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	–20	60°C

ELECTRICAL CHARACTRISTICS

Ta=25°C, V_{DD}=5.0V±0.25V, V_{EE}=–5.0V±0.25V

Input "high" voltage (V_{iH})	0.7 x V_{DD}V min.
Input "low" voltage (V_{iL})	0.3 x V_{DD}V max.
Clock frequency (f_{CL2})	210 KHz min. 300 KHz typ. 390 KHz max.
Power supply current (I_{DD})	3mA typ.
(I_{EE})	1mA

D_1, D_2=GND, f_{CL2}=300 KHz

Power supply for LCD drive (Recommended) (V_O-V_{EE})

Du=1/20

at Ta= 0°C	5.5V typ.
at Ta=25°C	5.0V typ.
at Ta=50°C	4.0V typ.

OPTICAL DATA .... See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM single indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D1	H/L	Serial row data
5	CL2	H→L	Clock signal for shifting the serial data
6	V_{DD}(+5V)	–	Power supply for logic circuit
7	V_{SS}(GND)	–	Ground
8	V_{EE}(–5V)	–	Power supply for LC driving
9	V_O	–	Operating voltage for LC driving
10	NC	–	No connection

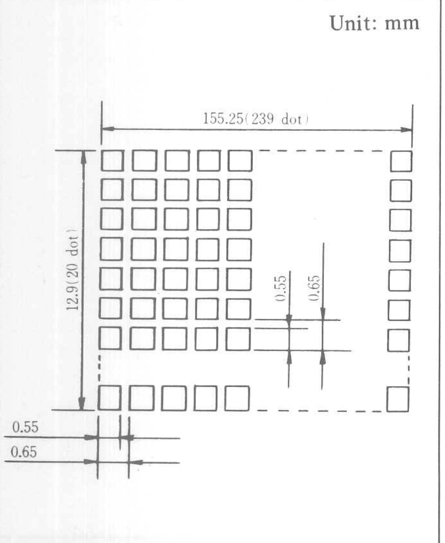

Unit: mm
155.25(239 dot)
12.9(20 dot)
0.55
0.65
0.55
0.65

Fig. 1 Display pattern

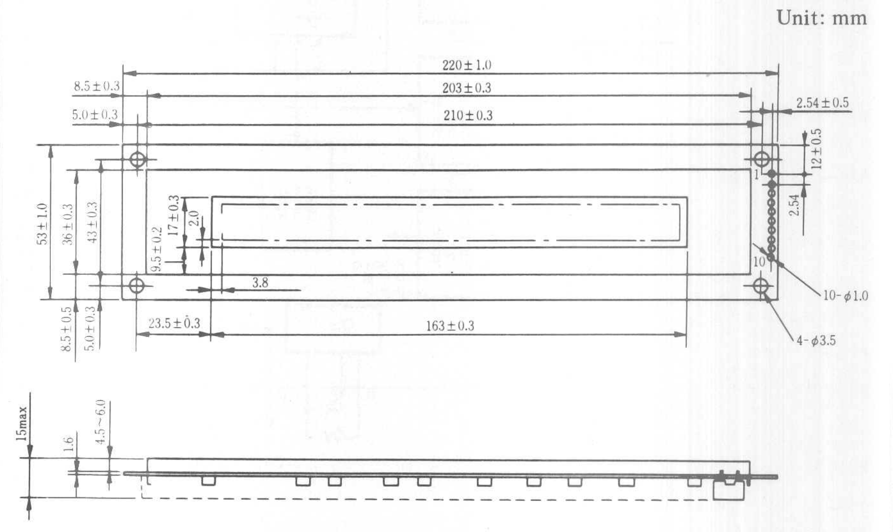

Unit: mm
220±1.0
203±0.3
210±0.3
8.5±0.3
5.0±0.3
2.54±0.5
12±0.5
2.54
1
10
10-φ1.0
4-φ3.5
53±1.0
36±0.3
43±0.3
9.5±0.2
17±0.3
2.0
3.8
8.5±0.5
5.0±0.3
23.5±0.3
163±0.3
15max
1.6
4.5~6.0

Fig. 2 External dimensions

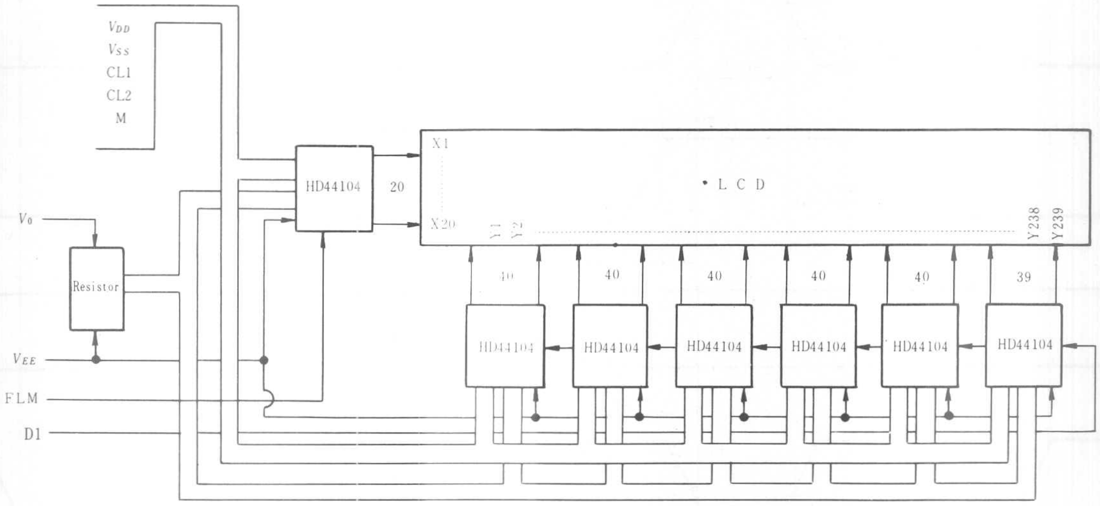
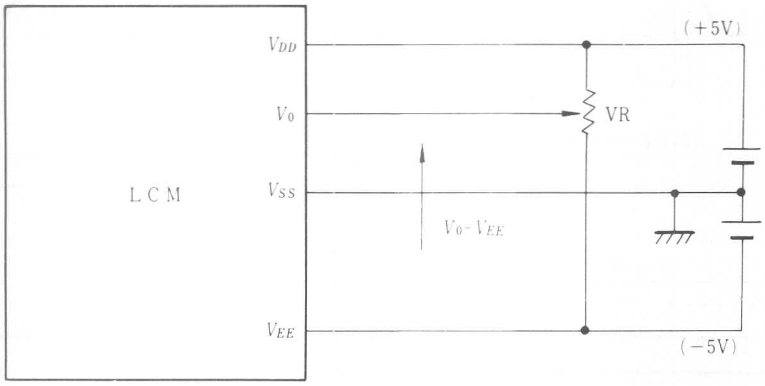

V_{DD}
V_{SS}
CL1
CL2
M
V_0
Resistor
V_{EE}
FLM
D1
HD44104
20
X1
X20
• L C D
Y1
Y2
Y238
Y239
40
40
40
40
40
39
HD44104
HD44104
HD44104
HD44104
HD44104
HD44104

Fig. 3 Block diagram


L C M
V_{DD}
V_0
V_{SS}
V_{EE}
(+5V)
VR
$V_0 - V_{EE}$
(−5V)

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	min.	typ.	max.	Unit
Clock frequency	f_{CL2}	–	–	500	KHz(Note 1)
Clock pulse width (High level)	t_{CWH}	800	–	–	ns
Clock pulse width (Low level)	t_{CWL}	800	–	–	ns
Clock set up time	t_{CSU}	500	–	–	ns
Data set up time	t_{SU}	300	–	–	ns
FLM set up time	t_{FSU}	300	–	–	ns
M delay time	t_{DM}	−1000	0	+1000	ns (Note 2)
FLM hold time	t_{FH}	0	–	–	ns
Data hold time	t_{DH}	300	–	–	ns

Note 1. Optimum frequency for the highest contrast is different by the type of module.

Note 2. Timing of M signal to CLI may be in the range of ±1000ns.

Note 3. In adjusting FLM frequency, avoid setting it around the commercial frequency (50Hz±2Hz or 60Hz ±2Hz) to prevent LCD flicker.

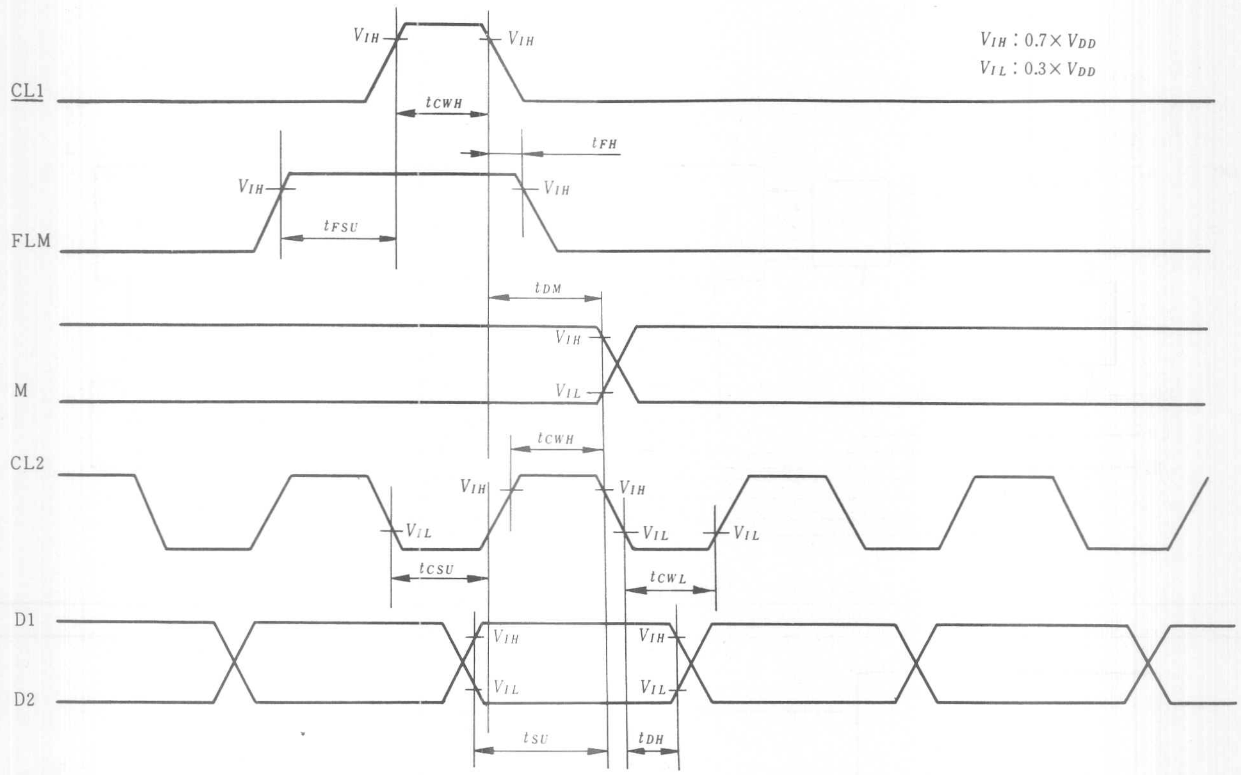
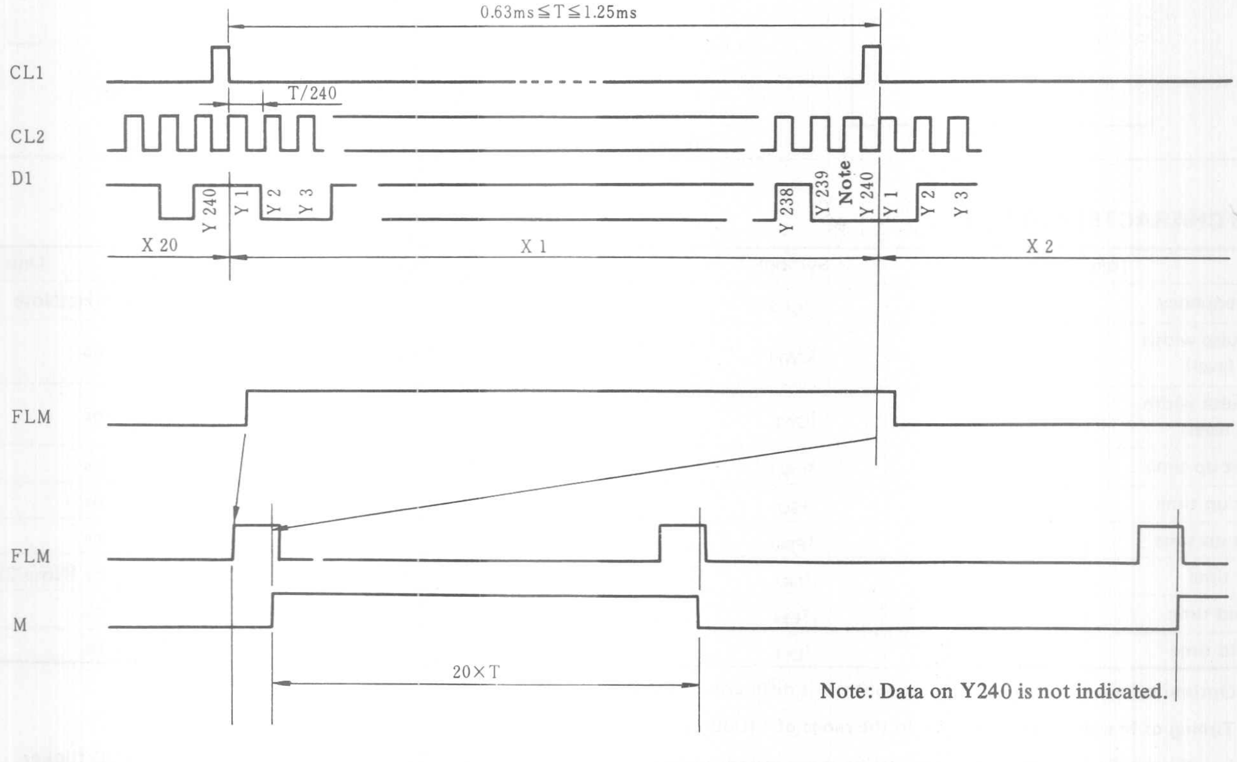

VIH : 0.7× VDD
VIL : 0.3× VDD
CL1
VIH
VIH
tCWH
tFH
FLM
VIH
VIH
tFSU
tDM
M
VIH
VIL
CL2
tCWH
VIH
VIH
VIL
VIL
VIL
tCSU
tCWL
D1
D2
VIH
VIH
VIL
VIL
tSU
tDH

Fig. 5 Interface timing (data write)


0.63ms≦T≦1.25ms
CL1
T/240
CL2
D1
Y 240
Y 1
Y 2
Y 3
Y 238
Y 239
Note
Y 240
Y 1
Y 2
Y 3
X 20
X 1
X 2
FLM
FLM
M
20×T

Note: Data on Y240 is not indicated.

Fig. 6 Interface timing (data read)

LM200

- 240 dot (W) x 64 dot (H) graphic and alpha-numeric display
- Control LSI HD61830 attachment type

MECHANICAL DATA (Nominal dimensions)

Module size	180W x 75H x 15D (max) mm
Effective display area	132W x 39H mm
Number of dots	240W x 64H dot
Dot size	0.48W x 0.48H mm
Pitch	0.53W x 0.53H mm
Weight	about 150g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_{EE}$)	0	13.5V
Input voltage (V_i)	V_{SS}	V_{DD}V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	60°C

ELECTRICAL CHARACTRISTICS

Ta=25°C, V_{DD}=5.0V±0.25V, V_{EE}=−5.0V±0.25V

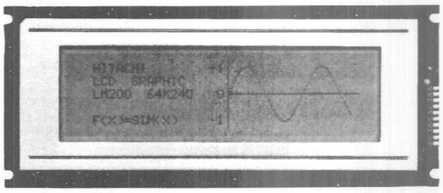
Input "high" voltage (V_{iH})	0.7 x V_{DD}V min.
Input "low" voltage (V_{iL})	0.3 x V_{DD}Vmax.
Clock frequency (f_{CL2})	390 KHz min. 460 KHz typ. 520 KHz max.
Power supply current (I_{DD}) (D_1, D_2=GND, f_{CL2}=460 KHz)	5mA typ.

Power supply for LCD drive (Recommended) (V_O-V_{EE})

Du=1/32

at Ta= 0°C	7.0V typ.
at Ta=25°C	6.5V typ.
at Ta=50°C	5.8V typ.

OPTICAL DATA .... See Page 6


HITACHI
LCD GRAPHIC
LM200 64X240
F(X)=SIN(X)
+1
0
-1

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	D1	H/L	Serial row data
2	FLM	H	The FLM signal indicates the beginning of each display cycle.
3	M	H/L	Control signal for a.c. driving
4	CL1	H→L	The CL1 latches the serial data in the shift registers.
5	CL2	H→L	Clock signal for shifting the serial data
6	D2	H/L	Serial row data
7	V_{DD}(+5V)		Power supply for logic circuit
8	V_{SS}(GND)	−	Ground
9	V_{EE}(−5V)	−	Power supply for LC driving
10	V_O	−	Operating voltage for LC driving

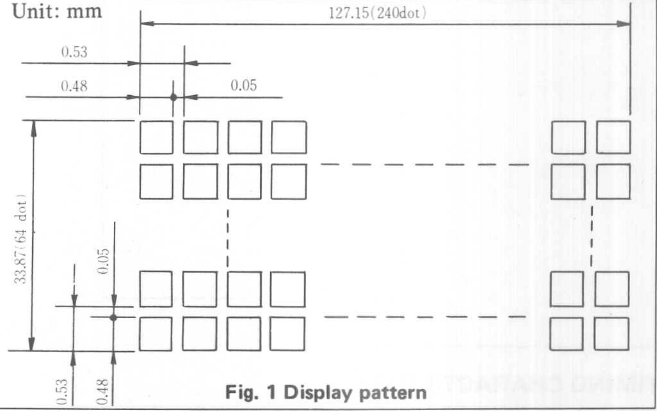

Unit: mm
127.15(240dot)
0.53
0.48
0.05
33.87(64 dot)
0.05
0.53
0.48

Fig. 1 Display pattern

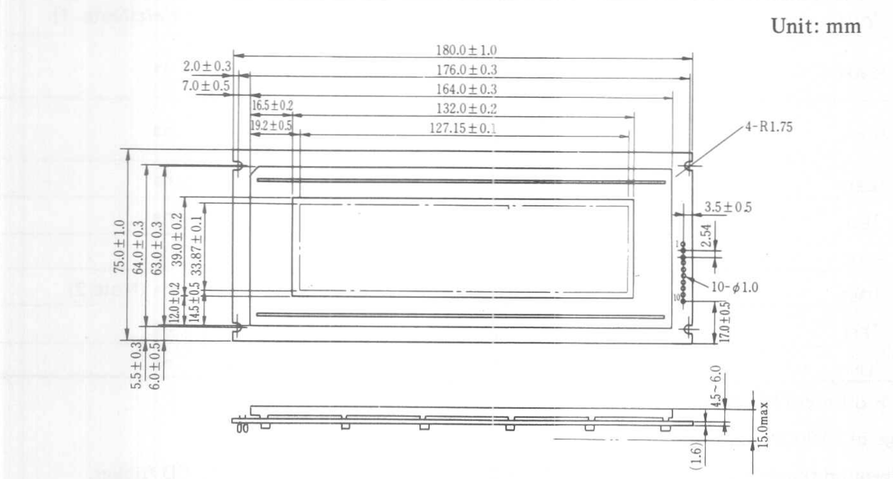

Unit: mm
180.0±1.0
2.0±0.3
176.0±0.3
7.0±0.5
164.0±0.3
16.5±0.2
132.0±0.2
19.2±0.5
127.15±0.1
4-R1.75
3.5±0.5
2.54
10-φ1.0
1
10
17.0±0.5
75.0±1.0
64.0±0.3
63.0±0.3
39.0±0.2
33.87±0.1
12.0±0.2
14.5±0.5
5.5±0.3
6.0±0.5
4.5~6.0
15.0max
(1.6)

Fig. 2 External dimensions

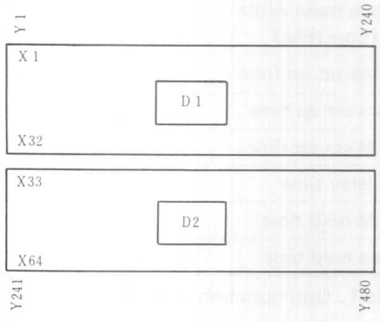

Y1
Y240
X1
D1
X32
X33
D2
X64
Y241
Y480

Fig. 3 Comparison of display and data

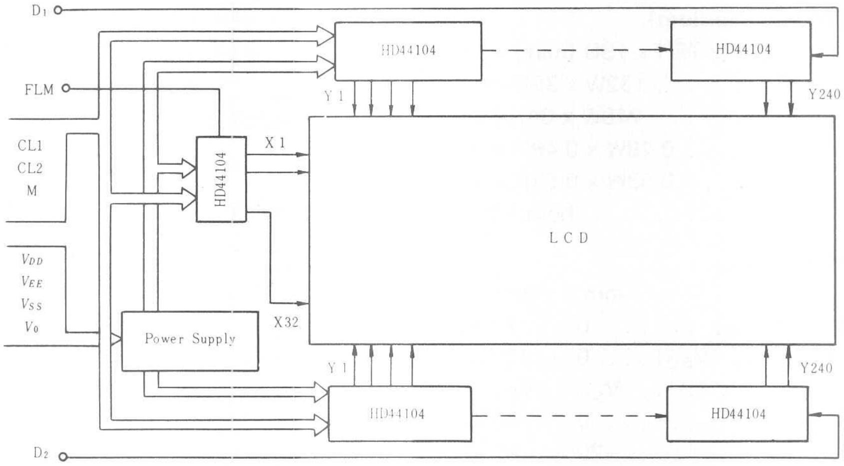
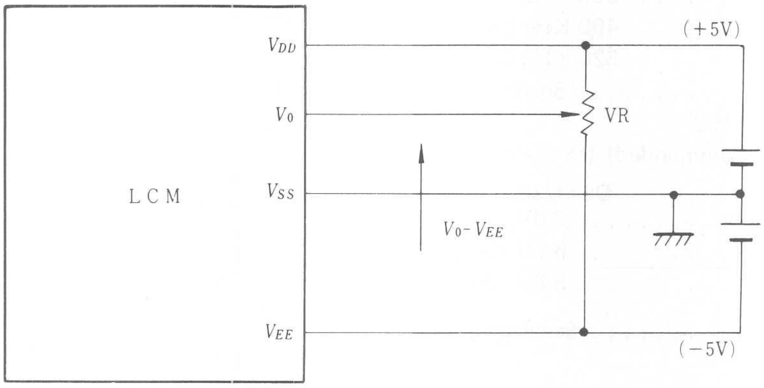

D1
FLM
CL1
CL2
M
VDD
VEE
VSS
V0
HD44104
HD44104
X1
Y1
Y240
LCD
Power Supply
X32
HD44104
HD44104
HD44104
Y1
Y240
D2

Fig. 4 **Block diagram**


LCM
VDD
V0
VSS
VEE
(+5V)
VR
V0- VEE
(−5V)

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 5 **Power supply**

TIMING CHARACTERISTICS

Item	Symbol	min.	typ.	max.	Unit
Clock frequency	f_{CL2}	–	–	500	KHz(Note 1)
Clock pulse width (High level)	t_{CWH}	800	–	–	ns
Clock pulse width (Low level)	t_{CWL}	800	–	–	ns
Clock set up time	t_{CSU}	500	–	–	ns
Data set up time	t_{SU}	300	–	–	ns
FLM set up time	t_{FSU}	300	–	–	ns
M delay time	t_{DM}	–1000	0	+1000	ns (Note 2)
FLM hold time	t_{FH}	0	–	–	ns
Data hold time	t_{DH}	300	–	–	ns

Note 1. Optimum frequency for the highest contrast is different by the type of module.

Note 2. Timing of M signal to CLI may be in the range of ±1000ns.

Note 3. In adjusting FLM frequency, avoid setting it around the commercial frequency (50Hz±2Hz or 60Hz ±2Hz) to prevent LCD flicker.

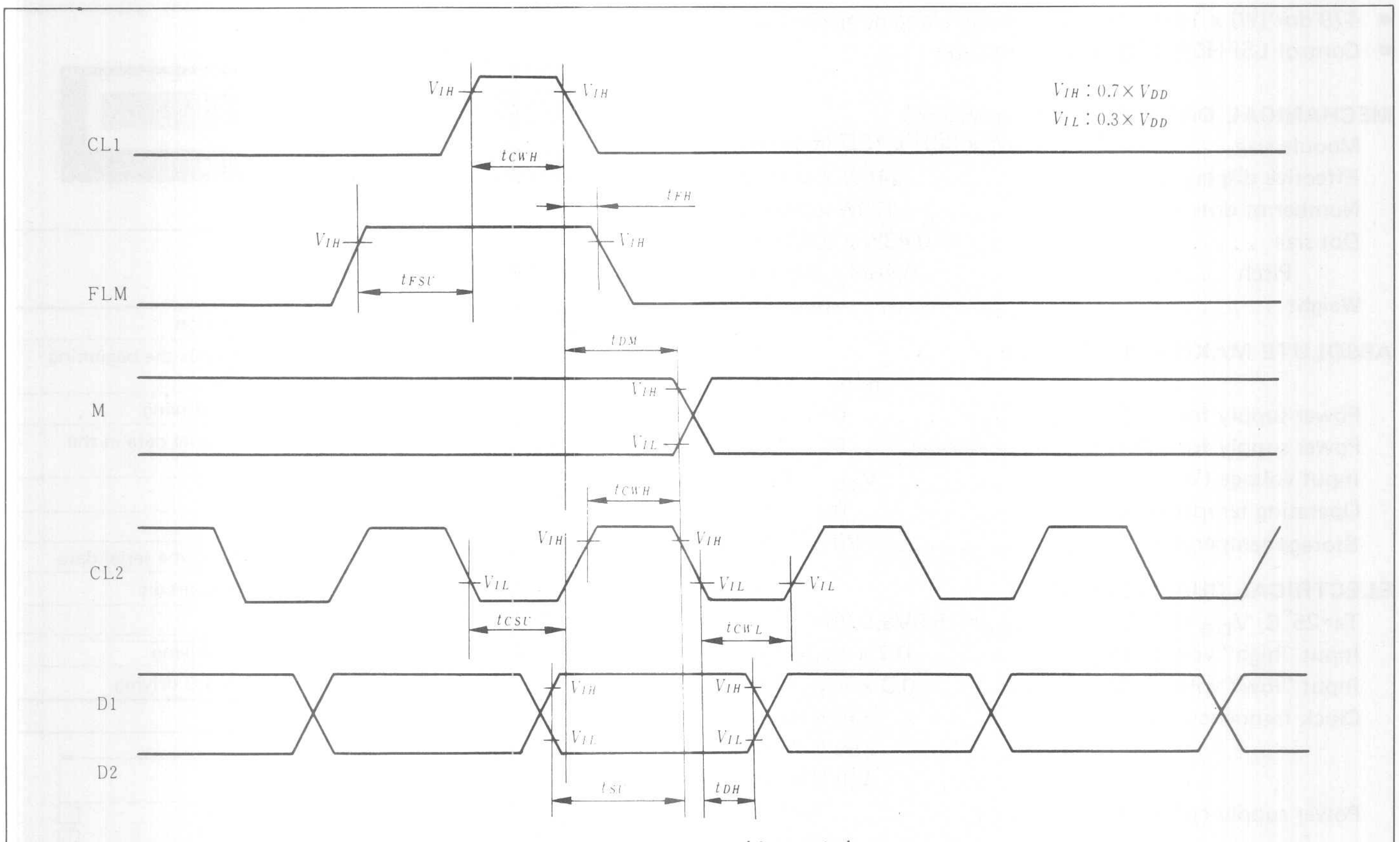

CL1
FLM
M
CL2
D1
D2
VIH : 0.7×VDD
VIL : 0.3×VDD
VIH
VIL
tCWH
tFH
tFSU
tDM
tCSU
tCWL
tSU
tDH

Fig. 6 Interface timing (data write)

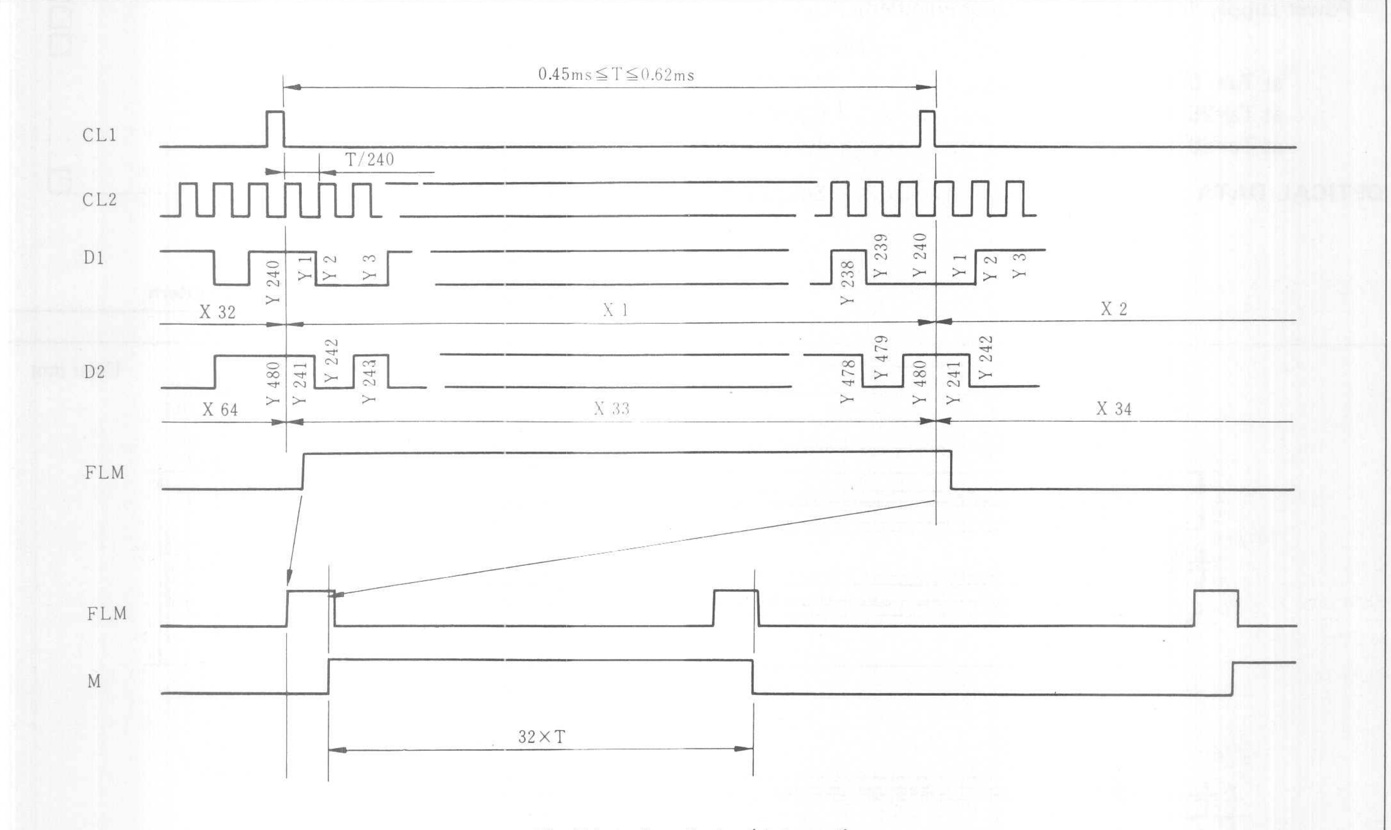
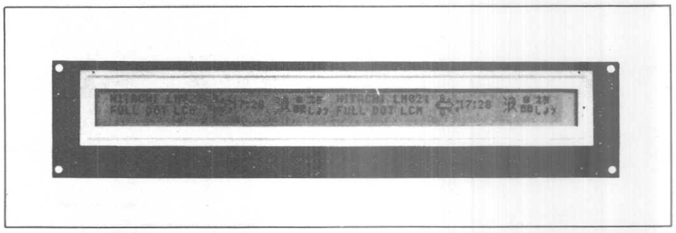

0.45ms≦T≦0.62ms
CL1
T/240
CL2
D1
Y 240
Y 1
Y 2
Y 3
Y 238
Y 239
Y 240
Y 1
Y 2
Y 3
X 32
X 1
X 2
D2
Y 480
Y 241
Y 242
Y 243
Y 478
Y 479
Y 480
Y 241
Y 242
X 64
X 33
X 34
FLM
FLM
M
32×T

Fig. 7 Interface timing (data read)

LM021

- 479 dot (W) x 19 dot (H) graphic and alpha-numeric display
- Control LSI HD61830 attachment type



MECHANICAL DATA (Nominal dimensions)

Module size	290W x 60H x 13D (max) mm
Effective display area	245W x 19H mm
Number of dots	479W x 24H dot
Dot size	0.43W x 0.55H mm
Pitch	0.48W x 0.6H mm
Weight	about 150g

ABSOLUTE MAXIMUM RATINGS

	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_{EE}$)	0	13.5V
Input voltage (V_i)	V_{SS}	V_{DD}V
Operating temperature (Ta)	0	50°C
Storage temperature (Tstg)	−20	60°C

ELECTRICAL CHARACTRISTICS

Ta=25°C, V_{DD}=5.0V±0.25V, V_{EE}=−5.0V±0.25V

Input "high" voltage (V_{iH})	0.7 x V_{DD}V min.
Input "low" voltage (V_{iL})	0.3 x V_{DD}V max.
Clock frequency (f_{CL2})	230 KHz min. 350 KHz typ. 460 KHz max.
Power supply current (I_{DD})	4mA typ.
(I_{EE})	2mA max.

(D_1, D_2=GND, f_{CL2}=350 KHz)

Power supply for LCD drive (Recommended) (V_O-V_{EE})

Duty = 1/24

at Ta= 0°C	6.0 V typ.
at Ta=25°C	5.4 V typ.
at Ta=50°C	4.4 V typ.

OPTICAL DATA .... See page 6

INTERNAL PIN CONNECTION

Pin No.	Symbol	Level	Function
1	FLM	H	The FLM signal indicates the beginning of each display cycle.
2	M	H/L	Control signal for a.c. driving.
3	CL1	H→L	The CL1 latches the serial data in the shift registers.
4	D1	H/L	Serial row data
5	D2	H/L	Serial row data
6	CL2	H→L	Clock signal for shifting the serial data
7	V_{DD}(+5V)	–	Power supply for logic circuit
8	V_{SS}(GND)	–	Ground
9	V_{EE}(−5V)	–	Power supply for LC driving
10	V_O	–	Operating voltage for LC driving

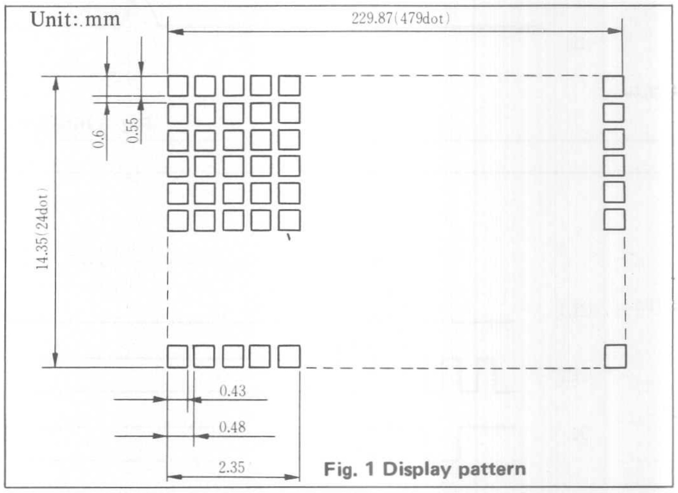

Unit: mm
229.87(479dot)
0.6
0.55
14.35(24dot)
0.43
0.48
2.35

Fig. 1 Display pattern

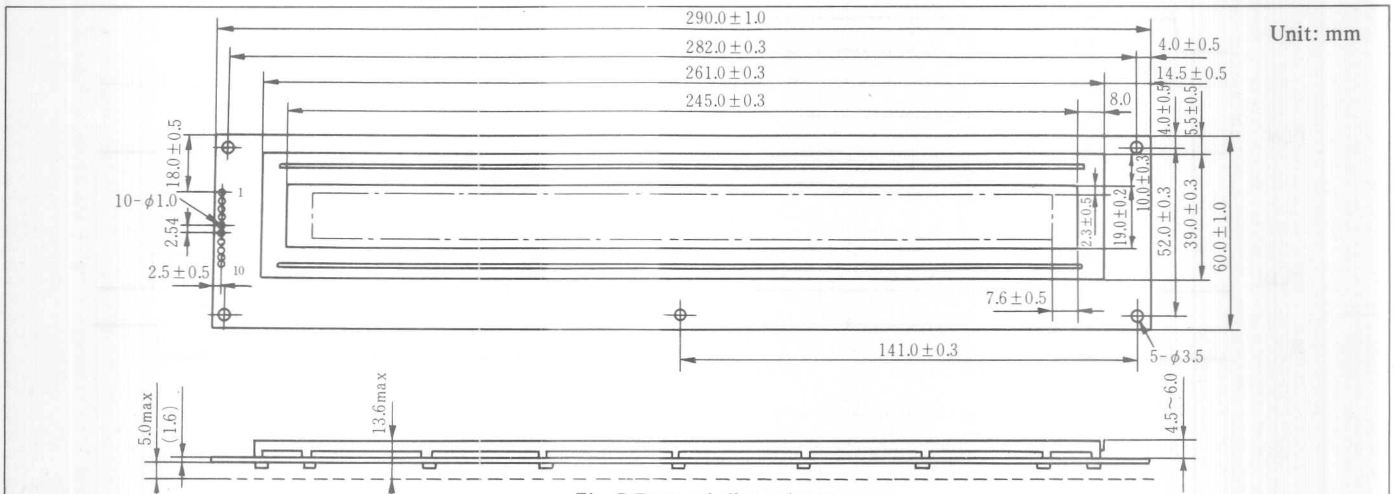

Unit: mm
290.0±1.0
282.0±0.3
261.0±0.3
245.0±0.3
4.0±0.5
14.5±0.5
8.0
4.0±0.5
5.5±0.5
18.0±0.5
10-φ1.0
1
10
2.54
2.5±0.5
2.3±0.5
19.0±0.2
10.0±0.3
52.0±0.3
39.0±0.3
60.0±1.0
7.6±0.5
141.0±0.3
5-φ3.5
5.0max
(1.6)
13.6max
4.5~6.0

Fig. 2 External dimensions

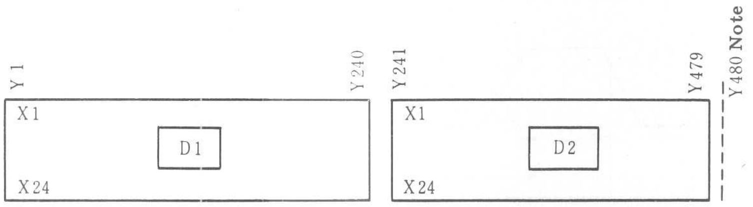

Y 1
Y 240
Y 241
Y 479
Y 480 Note
X 1
X 24
D 1
X1
X 24
D 2

Fig. 3 Comparison of display and data

Note: Y480 is a dummy line.

Note: IC1~IC14 : HD44100

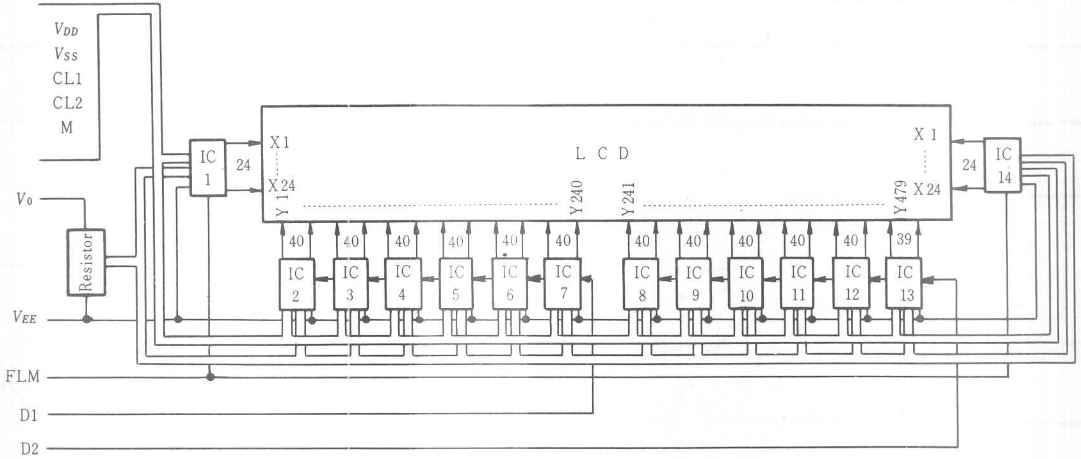

V_DD
Vss
CL1
CL2
M
V0
Resistor
V_EE
FLM
D1
D2
IC 1
24
X1
X24
L C D
Y 1
Y 240
Y 241
Y 479
X 1
X 24
24
IC 14
40
IC 2
IC 3
IC 4
IC 5
IC 6
IC 7
IC 8
IC 9
IC 10
IC 11
IC 12
39
IC 13

Fig. 4 Block diagram

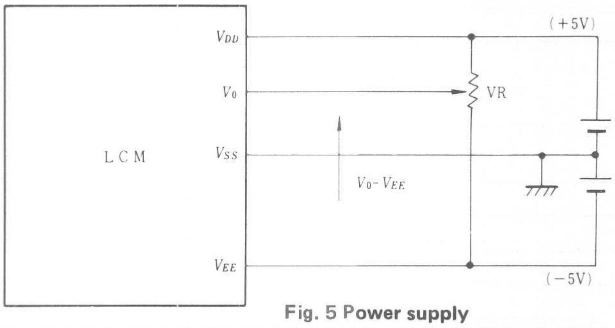

LCM
V_DD
V0
Vss
V_EE
(+5V)
VR
V0-V_EE
(−5V)

Fig. 5 Power supply

V_O-V_{EE}: LCD driving voltage
VR: 10kΩ~20kΩ

TIMING CHARACTERISTICS

Item	Symbol	min.	typ.	max.	Unit
Clock frequency	f_{CL2}	–	–	500	KHz(Note 1)
Clock pulse width (High level)	t_{CWH}	800	–	–	ns
Clock pulse width (Low level)	t_{CWL}	800	–	–	ns
Clock set up time	t_{CSU}	500	–	–	ns
Data set up time	t_{SU}	300	–	–	ns
FLM set up time	t_{FSU}	300	–	–	ns
M delay time	t_{DM}	−1000	0	+1000	ns (Note 2)
FLM hold time	t_{FH}	0	–	–	ns
Data hold time	t_{DH}	300	–	–	ns

Note 1. Optimum frequency for the highest contrast is different the type of module.

Note 2. Timing of M signal to CLI may be in the range of ±1000ns.

Note 3. In adjusting FLM frequency, avoid setting it around the commercial frequency (50Hz±2Hz or 60Hz ±2Hz) to prevent LCD flicker.

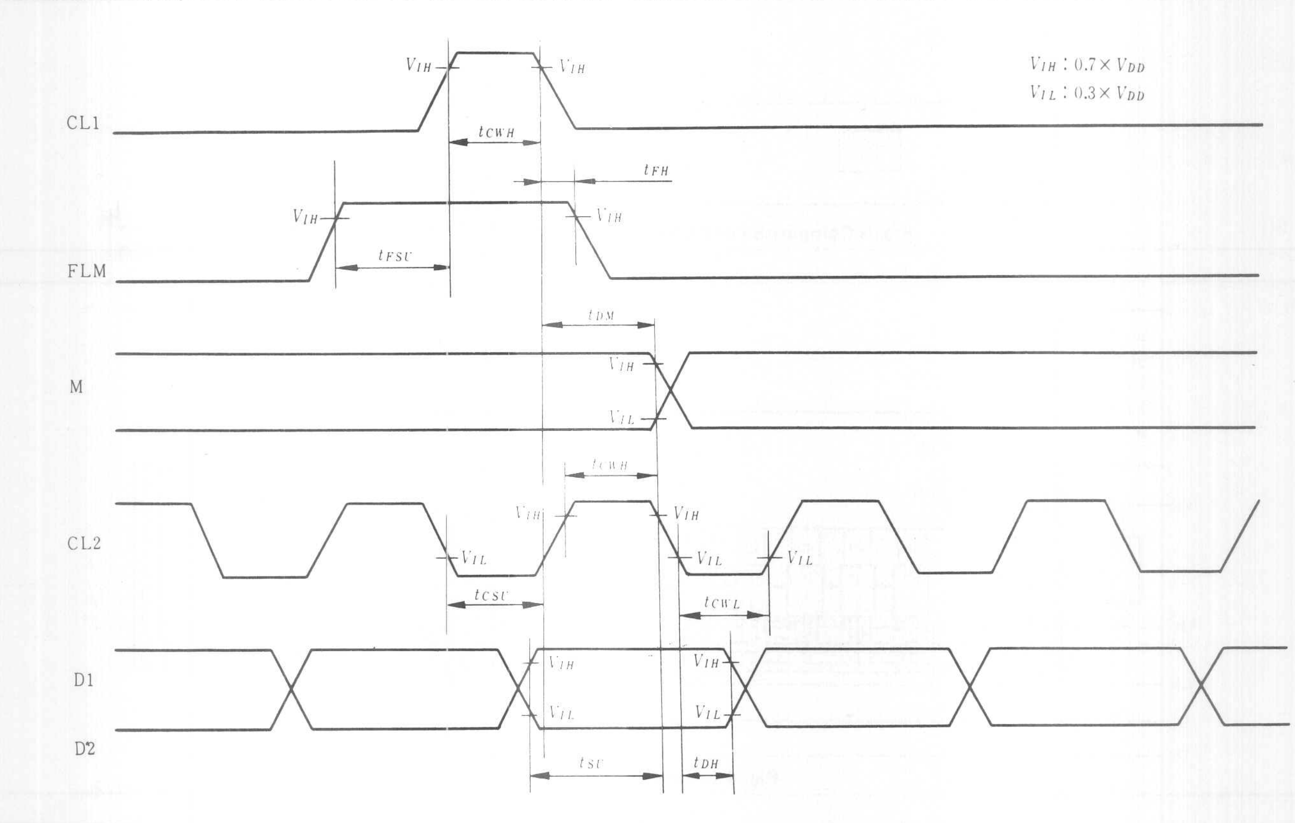
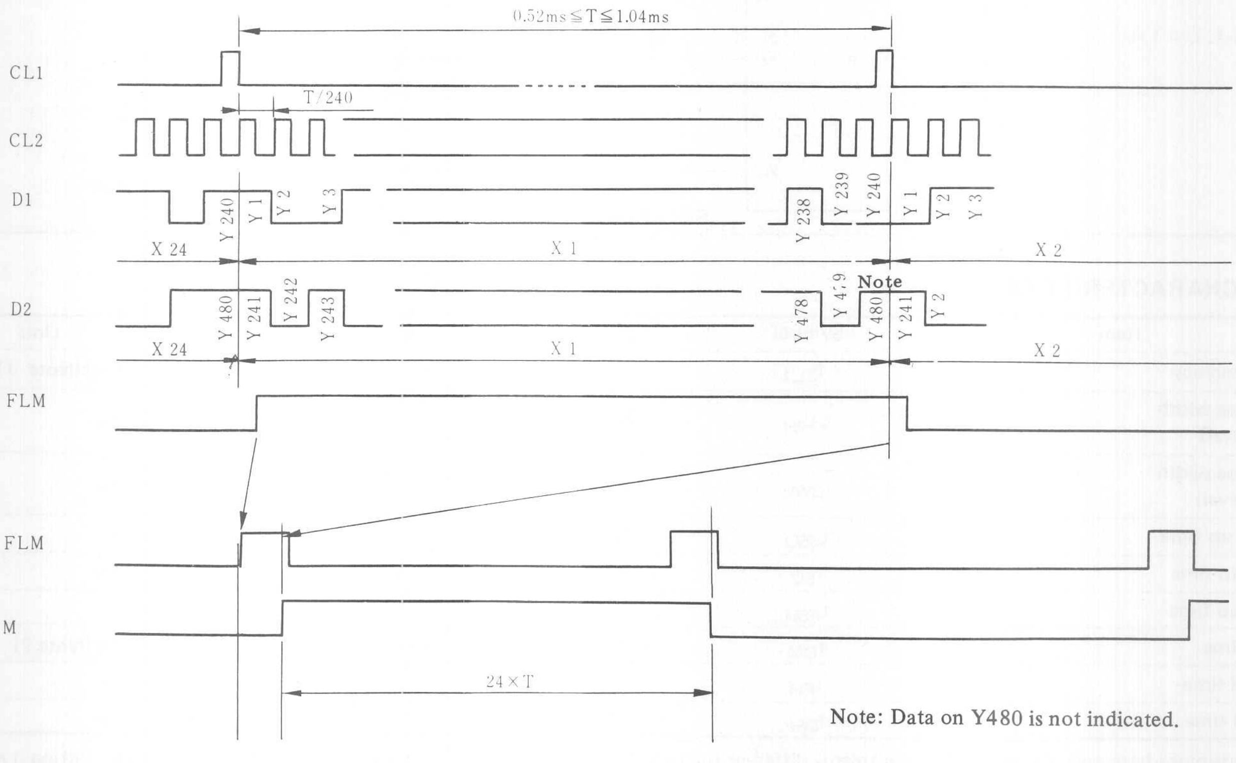

V_IH : 0.7 × V_DD
V_IL : 0.3 × V_DD
CL1
FLM
M
CL2
D1
D2
V_IH
V_IL
t_CWH
t_FH
t_FSU
t_DM
t_CSU
t_CWL
t_SU
t_DH

Fig. 6 Interface timing (data write)


0.52ms ≦ T ≦ 1.04ms
CL1
CL2
T/240
D1
Y 240
Y 1
Y 2
Y 3
Y 238
Y 239
Y 240
Y 1
Y 2
Y 3
X 24
X 1
X 2
D2
Y 480
Y 241
Y 242
Y 243
Y 478
Y 479
Note
Y 480
Y 241
Y 2
X 24
X 1
X 2
FLM
FLM
M
24 × T

Note: Data on Y480 is not indicated.

Fig. 7 Interface timing (data read)

LM054

- 8 position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	84W x 44H x 15D (max.) mm
Effective display area	61W x 15.8H mm
Character size (5 x 7 dots)	6,7W x 9.4H mm
Pitch	7.4 mm
Dot size	1.3W x 1.3H mm
Weight	about 25 g

ABSOLUTE MAXIMUM RATINGS	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5V
Input voltage (V_I)	V_{SS}	V_{DD}V
Operating temperature (T_A)	0	+50°C
Storage temperature (T_{STG})	−20	+70°C

ELECTRICAL CHARACTERISTICS

Ta = 25°C, V_{DD} = 5.0V ±0.25V

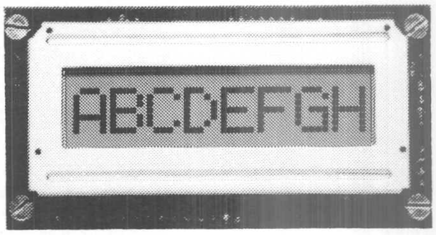
Input «high» voltage (V_{IH})	2.2V min.
Input «low» voltage (V_{IL})	0.6V max.
Output «high» voltage (V_{OH}) ($-I_{OH}$ = 0.2mA)	2.4V min.
Output «low» voltage (V_{OL}) (I_{OL} = 1.2mA)	0.4V max.
Power supply current (I_{DD}) (V_{DD} = 5.0V)	0.5mA typ. 3.0mA max.

Power supply for LCD drive (Recommended)

($V_{DD}-V_O$) DU = 1/8

at T_A = 0°C	4.2V typ.
at T_A = 25°C	3.8V typ.
at T_A = 50°C	3.3V typ.

OPTICAL DATA .... See page 6



Internal Pin Connection

Pin No.	Symbol	Level	Function	
1	V_{SS}	-	0V	Power Supply
2	V_{DD}	-	5V	
3	V_O	-	-	
4	RS	H/L	L: Instruction code output H: Data input	
5	R/W	H/L	H: Data read (LCD module−MPU) L: Data write (LCD module−MPU)	
6	E	H,H−L	Enable signal	
7	DBO	H/L	Data bus line Note 1, Note 2	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1 operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \approx DB_7$ and $DB_0 \approx DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \approx DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \approx DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \approx DB_7$.

Unit: mm

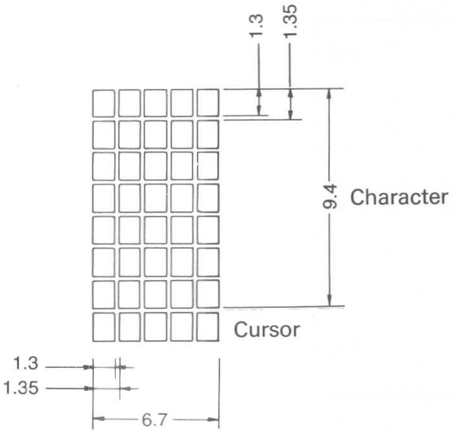


Fig. 1 Display pattern

Unit: mm

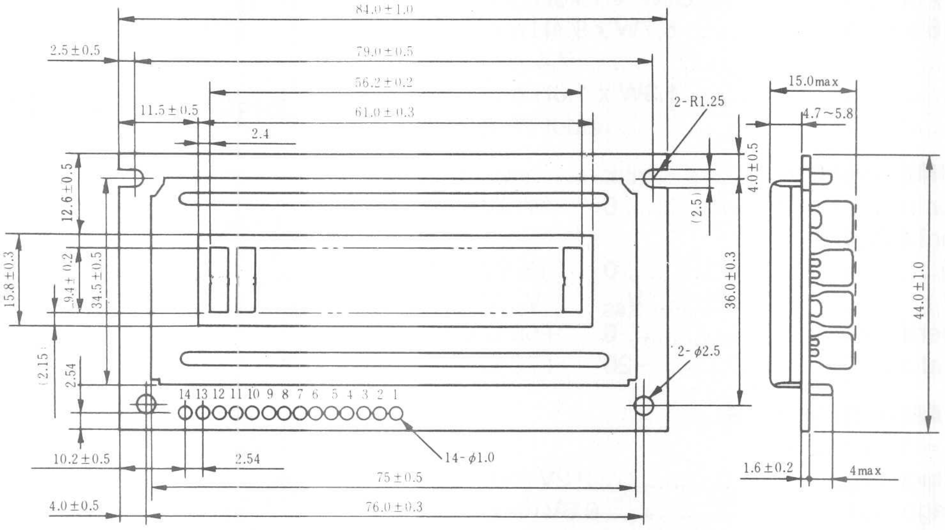

84.0±1.0
79.0±0.5
56.2±0.2
61.0±0.3
2.5±0.5
11.5±0.5
2.4
2-R1.25
15.0max
4.7~5.8
4.0±0.5
(2.5)
12.6±0.5
15.8±0.3
9.4±0.2
34.5±0.5
36.0±0.3
44.0±1.0
(2.15)
2.54
2-ϕ2.5
14 13 12 11 10 9 8 7 6 5 4 3 2 1
14-ϕ1.0
10.2±0.5
2.54
75±0.5
4.0±0.5
76.0±0.3
1.6±0.2
4max

Fig. 2 External dimensions

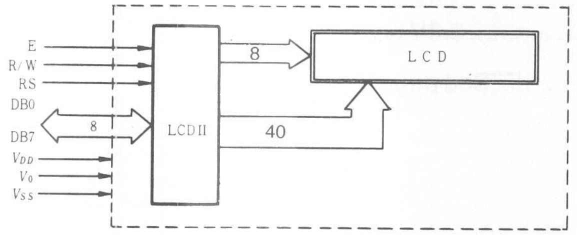

E
R/W
RS
DB0
DB7
8
V_{DD}
V_0
V_{SS}
LCDII
8
40
LCD

Fig. 3 Block diagram

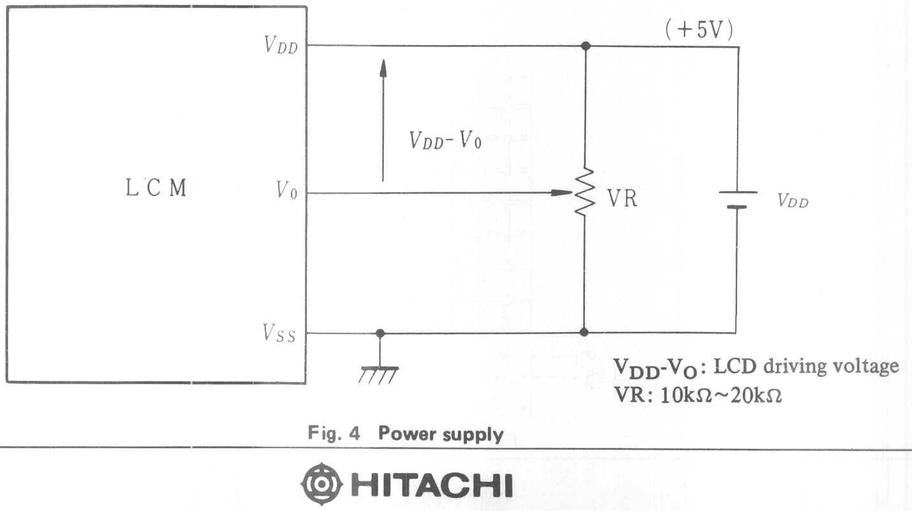

LCM
V_{DD}
V_0
V_{SS}
(+5V)
V_{DD}- V_0
VR
V_{DD}
V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	—	—	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	—	—	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	—	—	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	—	—	ns
Data delay time	t_{DDR}	Fig. 6	—	—	320	ns
Data set up time	t_{DSW}	Fig. 5	225	—	—	ns
Hold time	t_H	Fig. 5, Fig. 6	10	—	—	ns

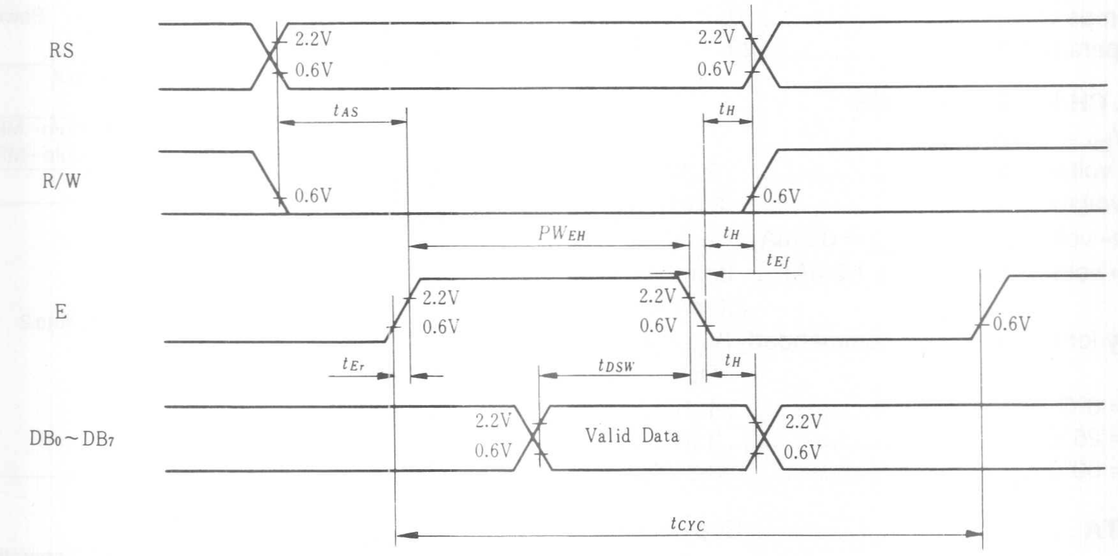

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

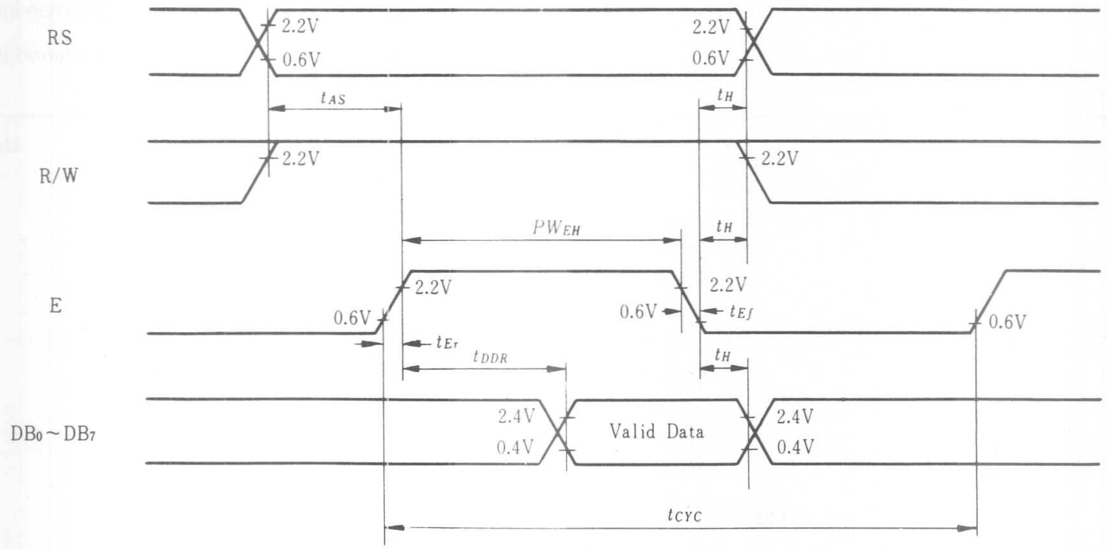

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
0.6V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

LM038

- 20 position alpha-numeric display
- Built-in control LSI HD44780 type (see page 7)

MECHANICAL DATA (Nominal dimensions)

Module size	182W x 33.5H x 13D (max.) mm
Effective display area	154.4W x 15.8H mm
Character size (5 x 7 dots)	6.7W x 9.4H mm
Pitch	7.4 mm
Dot size	1.3W x 1.3H mm
Weight	about 65 g

ABSOLUTE MAXIMUM RATINGS	min.	max.
Power supply for logic ($V_{DD}-V_{SS}$)	0	7.0V
Power supply for LCD drive ($V_{DD}-V_O$)	0	13.5V
Input voltage (V_{DD})	V_{SS}	V_{DD}V
Operating temperature (T_A	0	50°C
Storage temperature (T_{STG}	-20	70°C

ELECTRICAL CHARACTERISTICS

$T_A = 25°C$, $V_{DD} = 5.0V \pm 0.25V$

Input «high» voltage (V_{IH})	2.2V min.
Input «low» voltage (V_{IL})	0.6V max.
Output «high» voltage (V_{OH}) ($-I_{OH} = 0.2mA$)	2.4V min.
Output «low» voltage (V_{OL}) ($I_{OL} = 1.2mA$)	0.5mA typ. 2.0mA max.

Power supply for LCD drive (Recommended) ($V_{DD}-V_O$)
DU = 1/8

at $T_A = 0°C$	4.2V typ.
at $T_A = 25°C$	3.8V typ.
at $T_A = 50°C$	3.3V typ.

OPTICAL DATA .... See page 6

ABCDEFGHIJKLMNOPQRST

Internal Pin Connection

Pin No.	Symbol	Level	Function	
1	V_{SS}	-	0V	Power Supply
2	V_{DD}	-	5V	
3	V_O	-	-	
4	RS	H/L	L: Instruction code output H: Data input	
5	R/W	H/L	H: Data read (LCD module−MPU) L: Data write (LCD module−MPU)	
6	E	H,H−L	Enable signal	
7	DBO	H/L	Data bus line Note 1, Note 2	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

Note:

In the HD44780, the data can be sent in either 4-bit 2-operation or 8-bit 1 operation so that it can interface to both 4 and 8 bit MPU's.

(1) When interface data is 4 bits long, data is transferred using only 4 buses of $DB_4 \approx DB_7$ and $DB_0 \approx DB_3$ are not used. Data transfer between the HD44780 and the MPU completes when 4-bit data is transferred twice. Data of the higher order 4 bits (contents of $DB_4 \approx DB_7$ when interface data is 8 bits long) is transferred first and then lower order 4 bits (contents of $DB_0 \approx DB_3$ when interface data is 8 bits long).

(2) When interface data is 8 bits long, data is transferred using 8 data buses of $DB_0 \approx DB_7$.

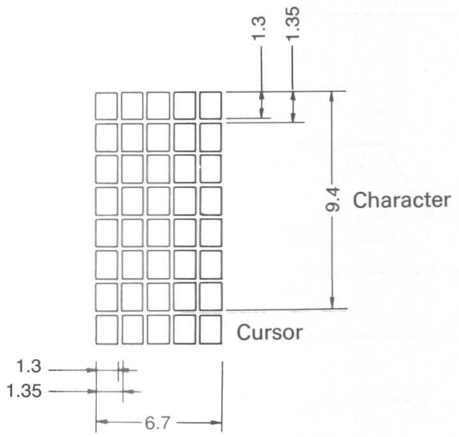


Fig. 1 Display pattern

Unit: mm

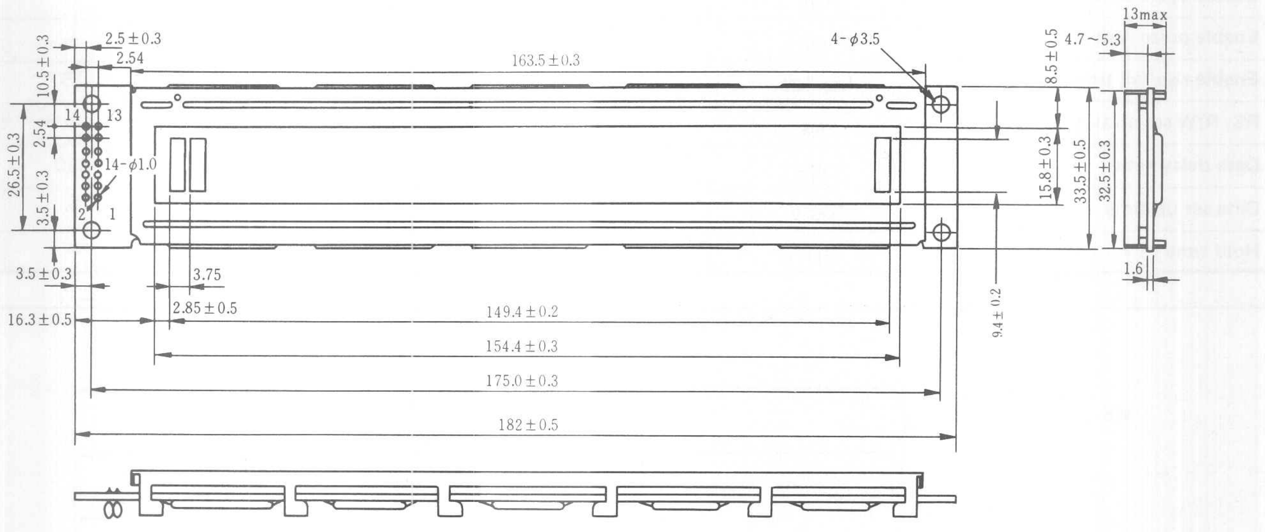

2.5±0.3
2.54
10.5±0.3
163.5±0.3
4-φ3.5
13max
4.7~5.3
8.5±0.5
14
13
2.54
26.5±0.3
14-φ1.0
3.5±0.3
2
1
15.8±0.3
33.5±0.5
32.5±0.3
3.5±0.3
3.75
1.6
16.3±0.5
2.85±0.5
149.4±0.2
9.4±0.2
154.4±0.3
175.0±0.3
182±0.5

Fig. 2 External dimensions

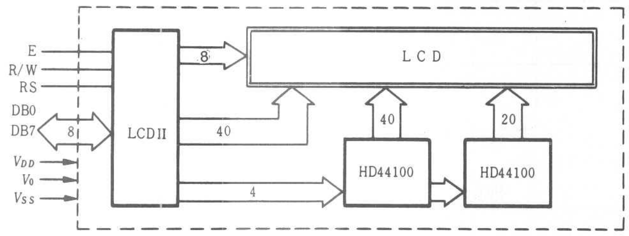
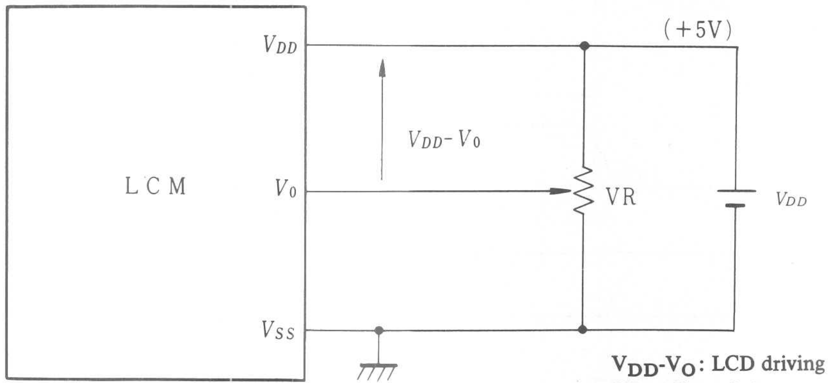

E
R/W
RS
DB0
DB7
8
LCDII
8
LCD
40
40
20
HD44100
HD44100
4
V_{DD}
V_0
V_{SS}

Fig. 3 Block diagram


LCM
V_{DD}
(+5V)
V_{DD}- V_0
V_0
VR
V_{DD}
V_{SS}

V_{DD}-V_O: LCD driving voltage
VR: 10kΩ~20kΩ

Fig. 4 Power supply

TIMING CHARACTERISTICS

Item	Symbol	Test condition	min.	typ.	max.	Unit
Enable cycle time	t_{cyc}	Fig. 5, Fig. 6	1.0	–	–	μs
Enable pulse width	P_{WEH}	Fig. 5, Fig. 6	450	–	–	ns
Enable rise/fall time	t_{Er}, t_{Ef}	Fig. 5, Fig. 6	–	–	25	ns
RS, R/W set up time	t_{AS}	Fig. 5, Fig. 6	140	–	–	ns
Data delay time	t_{DDR}	Fig. 6	–	–	320	ns
Data set up time	t_{DSW}	Fig. 5	225	–	–	ns
Hold time	t_H	Fig. 5, Fig. 6	10	–	–	ns

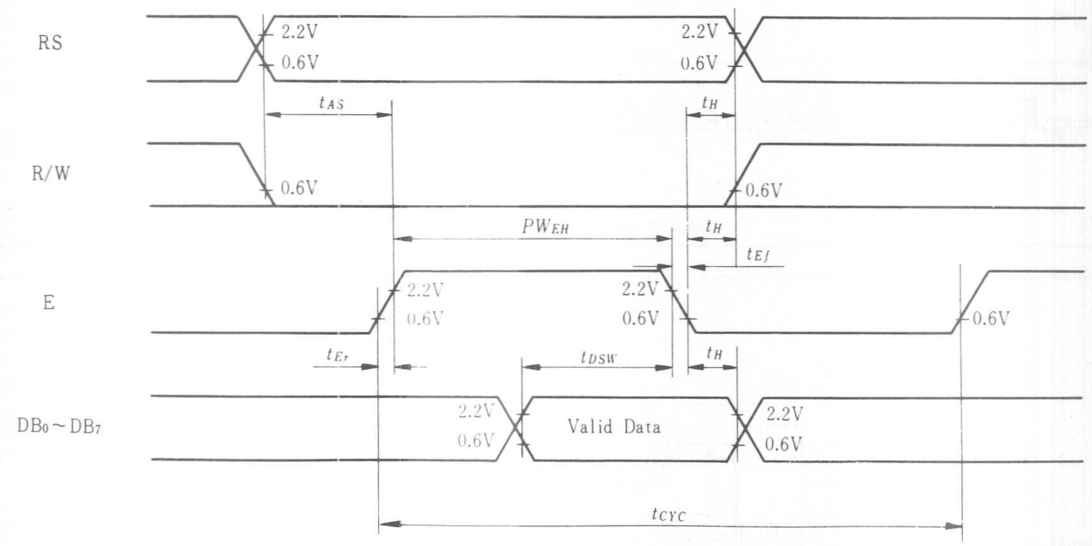

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
0.6V
0.6V
PWEH
tH
tEf
E
2.2V
0.6V
2.2V
0.6V
0.6V
tEr
tDSW
tH
DB0~DB7
2.2V
0.6V
Valid Data
2.2V
0.6V
tCYC

Fig. 5 Interface timing (data write)

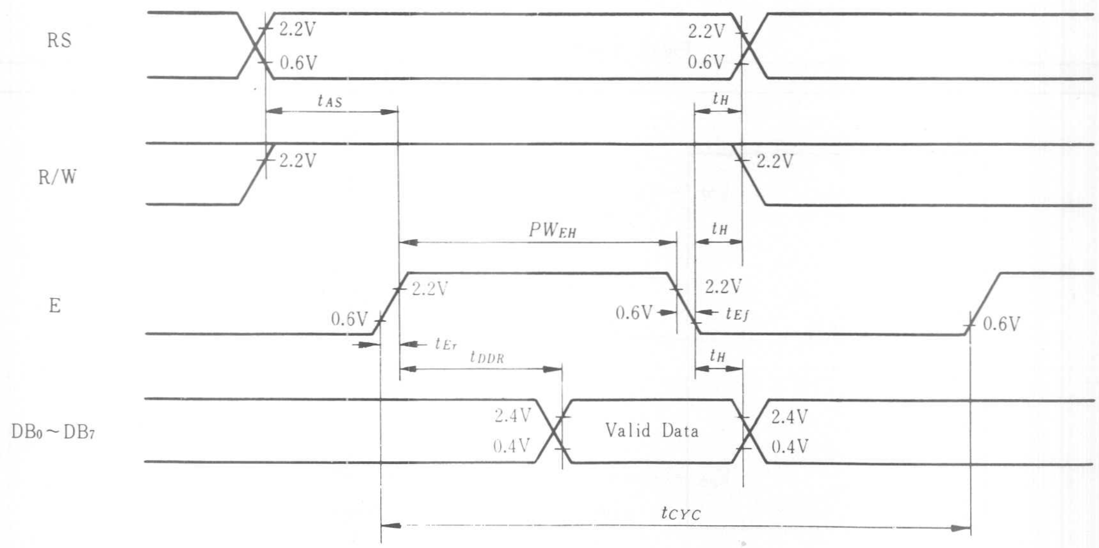

RS
2.2V
0.6V
2.2V
0.6V
tAS
tH
R/W
2.2V
2.2V
PWEH
tH
E
2.2V
0.6V
0.6V
2.2V
tEf
0.6V
tEr
tDDR
tH
DB0~DB7
2.4V
0.4V
Valid Data
2.4V
0.4V
tCYC

Fig. 6 Interface timing (data read)

7-Segment LCD's

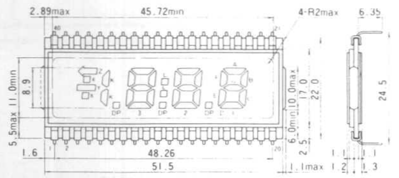
for Industrial Applications

A detailed catalogue of these LCD's is available on request.
These standard LCD's for industrial applications are function- and pin-compatible with other brands commonly available.

TECHNICAL DATA

	Standard Temperature Range			Extended Temperature Range		
	Min.	Typ.	Max.	Min.	Typ.	Max.
Operating Temperature	-10°C	25°C	+60°C	-20°C	25°C	+80°C
Storage Temperature	-20°C	-	+60°C	-20°C	-	+80°C
Input Voltage	3.0V	5.0V	6.0V	4.5V	5.0V	6.0V
Static Electricity	-	-	100mV	-	-	200mV
Rise Time at 25°C	-	50ms	100ms	-	45ms	100ms
Fall Time at 25°C	-	110ms	250ms	-	50ms	100ms

LS021C-C

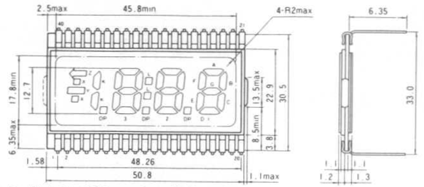

2.89max
45.72min
4-R2max
6.35
11.0min
8.9
5.5max
1.6
48.26
51.5
10.0max
17.0
22.0
6.0min
2.5
1.1max
1.2
1.3
24.5

3 1/2 Digits, Height of Characters 8.9 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	NC	24	B2
5	NC	25	A2
6	NC	26	F2
7	NC	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	NC
15	C2	35	NC
16	DP1	36	NC
17	E1	37	NC
18	D1	38	Z
19	C1	39	X
20	B1	40	NC

H1331C-C

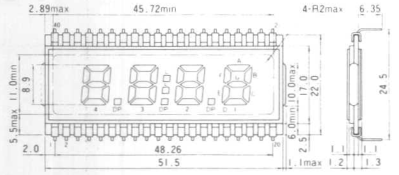

2.5max
45.8min
4-R2max
6.35
17.8min
12.7
6.35max
1.58
48.26
50.8
13.5max
22.9
30.5
8.5min
3.8
1.1max
1.2
1.3
33.0

3 1/2 Digits, Height of Characters 12.7 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	NC	24	B2
5	NC	25	A2
6	NC	26	F2
7	NC	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	NC
15	C2	35	NC
16	DP1	36	NC
17	E1	37	NC
18	D1	38	Z
19	C1	39	X
20	B1	40	BP

LS022C-C

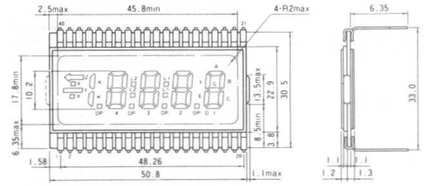

2.89max
45.72min
4-R2max
6.35
11.0min
8.9
5.5max
2.0
48.26
51.5
10.0max
17.0
22.0
6.0min
2.5
1.1max
1.2
1.3
24.5

4 Digits, Height of Characters 8.9 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	NC	22	F1
3	NC	23	G1
4	NC	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	B4
15	C2	35	A4
16	DP1	36	F4
17	E1	37	G4
18	D1	38	NC
19	C1	39	NC
20	B1	40	NC

H1332C-C

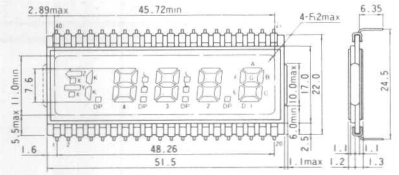

2.5max
45.8min
4-R2max
6.35
17.8min
10.2
6.35max
1.58
48.26
50.8
13.5max
22.9
30.5
8.5min
3.8
1.1max
1.2
1.3
33.0

4 1/2 Digits, Height of Characters 10.2 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	DP4	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP3	28	L1
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	L2
14	D2	34	B4
15	C2	35	A4
16	DP1	36	F4
17	E1	37	G4
18	D1	38	Z
19	C1	39	X
20	B1	40	BP

LS023C-C

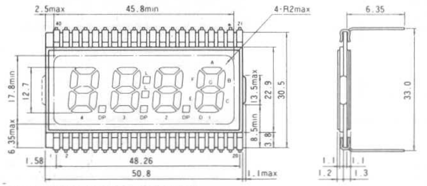

2.89max
45.72min
4-R2max
6.35
11.0min
7.6
5.5max
1.6
48.26
51.5
10.0max
17.0
22.0
6.0min
2.5
1.1max
1.2
1.3
24.5

4 1/2 Digits, Height of Characters 8.9 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	DP4	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP3	28	L1
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	L2
14	D2	34	B4
15	C2	35	A4
16	DP1	36	F4
17	E1	37	G4
18	D1	38	Z
19	C1	39	X
20	B1	40	NC

H1333C-C

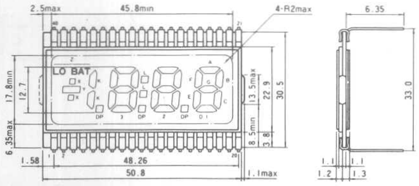

2.5max
45.8min
4-R2max
6.35
17.8min
12.7
6.35max
1.58
48.26
50.8
13.5max
22.9
30.5
8.5min
3.8
1.1max
1.2
1.3
33.0

4 Digits, Height of Characters 12.7 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	NC	22	F1
3	NC	23	G1
4	NC	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	B4
15	C2	35	A4
16	DP	36	F4
17	E1	37	G4
18	D1	38	NC
19	C1	39	NC
20	B1	40	BP

LS007C-C

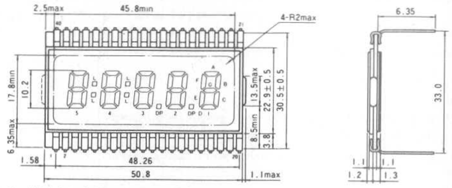

2.5max
45.8min
4-R2max
6.35
LO BAT
17.8min
12.7
6.35max
1.58
48.26
50.8
13.5max
22.9
30.5
8.5min
3.8
1.1max
1.2
1.3
33.0

3 1/2 Digits, Height of Characters 12.7 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	NC	24	B2
5	NC	25	A2
6	NC	26	F2
7	NC	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	NC
15	C2	35	NC
16	DP1	36	NC
17	E1	37	NC
18	D1	38	Z
19	C1	39	X
20	B1	40	BP

LS024C-C

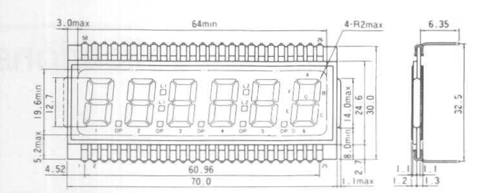

2.5max
45.8min
4-R2max
6.35
17.8min
10.2
6.35max
1.58
48.26
50.8
13.5max
22±0.5
30.5±0.5
8.5min
3.8
1.1max
1.2
1.3
33.0

5 Digits, Height of Characters 10.2 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	G5	22	F1
3	E5	23	G1
4	D5	24	B2
5	C5	25	A2
6	E4	26	F2
7	D4	27	G2
8	C4	28	B3
9	E3	29	A3
10	D3	30	F3
11	C3	31	G3
12	DP	32	L
13	E2	33	B4
14	D2	34	A4
15	C2	35	F4
16	DP	36	G4
17	E1	37	L
18	D1	38	B5
19	C1	39	A5
20	B1	40	F5

H1335C-C

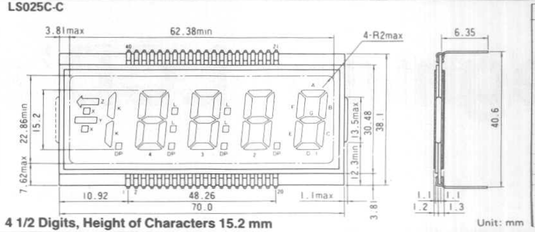

3.0max
64min
4-R2max
6.35
19.6min
12.7
5.2max
4.52
60.96
70.0
14.0max
24.6
30.0
8.0min
2.7
1.1max
32.5
1.2
1.3

6 Digits, Height of Characters 12.7 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP	21	DP5	41	G3
2	B1	22	E6	42	L1
3	D1	23	D6	43	B2
4	C1	24	C6	44	A2
5	DP1	25	B6	45	F2
6	E2	26	A6	46	G2
7	D2	27	F6	47	B1
8	C2	28	G6	48	A1
9	DP2	29	B5	49	F1
10	E3	30	A5	50	G1
11	D3	31	F5		
12	C3	32	G5		
13	DP3	33	L2		
14	E4	34	B4		
15	D4	35	A4		
16	C4	36	F4		
17	DP4	37	G4		
18	E5	38	B3		
19	D5	39	A3		
20	C5	40	F3		

LS025C-C

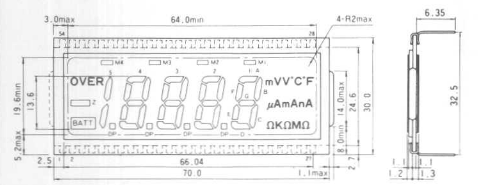

3.81max
62.38min
4-R2max
6.35
22.86min
15.2
7.62max
10.92
48.26
70.0
1.1max
12.3min
13.5max
30.48
38.1
3.81
40.6
1.2
1.3

4 1/2 Digits, Height of Characters 15.2 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	DP	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP	28	L1
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP	32	G3
13	E2	33	L2
14	D2	34	B4
15	C2	35	A4
16	DP	36	F4
17	E1	37	G4
18	D1	38	Z
19	C1	39	X
20	B1	40	NC

H1340-C-C

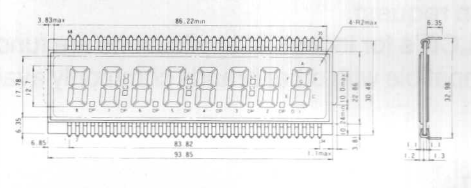

3.0max
64.0min
4-R2max
6.35
OVER
mVV°C°F
μAmAnA
ΩKΩMΩ
BATT
19.6min
13.6
5.2max
2.5
66.04
70.0
1.1max
14.0max
24.6
30.0
8.0min
2.7
32.5
1.2
1.3

4 1/2 Digits, Height of Characters 13.5 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP	21	KΩ	41	E2
2	Z	22	MΩ	42	B3
3	BATT	23	n	43	A3
4	BC5	24	A	44	M3
5	DP4	25	°C	45	F3
6	D4	26	°F	46	G3
7	C4	27	B F	47	E3
8	DP3	28	V	48	B4
9	D3	29	mV	49	A4
10	C3	30	B1	50	M4
11	DP2	31	A1	51	F4
12	D2	32	M1	52	G4
13	C2	33	F1	53	E4
14		34	G1	54	OVER
15	DP1	35	E1		
16	D1	36	B2		
17	C1	37	A2		
18	μA	38	M2		
19	mA	39	F2		
20	Ω	40	G2		

LS026C-C

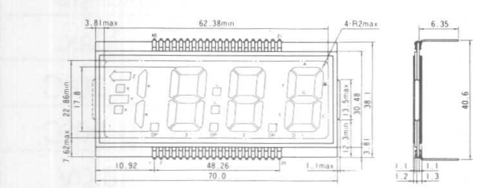

3.83max
86.22min
4-R2max
6.35
17.78
12.7
6.35
6.85
83.82
93.85
1.1max
10.74min
18.0max
30.48
32.98
1.2
1.3

8 Digits, Height of Characters 12.7 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	B P	21	C4	41	G2	61	B7
2	E 8	22	DP	42	L1	62	A7
3	D8	23	E3	43	B3	63	F7
4	C8	24	D3	44	A3	64	G7
5	DP	25	C3	45	F3	65	B8
6	E7	26	DP	46	G3	66	A8
7	D7	27	E2	47	B4	67	F8
8	C7	28	D2	48	A4	68	G8
9	DP	29	C2	49	F4		
10	BP	30	DP	50	G4		
11	E6	31	E1	51	L2		
12	D6	32	D1	52	B5		
13	C6	33	C1	53	A5		
14	DP	34	B1	54	F5		
15	E5	35	A1	55	G5		
16	D5	36	F1	56	B6		
17	C5	37	G1	57	A6		
18	DP	38	B2	58	F6		
19	E4	39	A2	59	G6		
20	D4	40	F2	60	L3		

H1336C-C

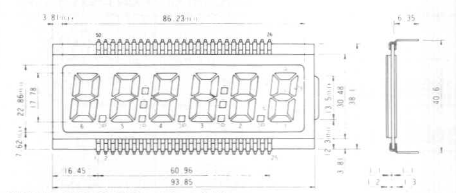

3.81max
62.38min
4-R2max
6.35
22.86min
17.8
7.62max
10.92
48.26
70.0
1.1max
12.3min
13.5max
30.48
38.1
3.81
40.6
1.2
1.3

3 1/2 Digits, Height of Characters 17.8 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	NC	24	B2
5	NC	25	A2
6	NC	26	F2
7	NC	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	NC
15	C2	35	NC
16	DP1	36	NC
17	E1	37	NC
18	D1	38	Z
19	C1	39	X
20	B1	40	BP

LS027C-C

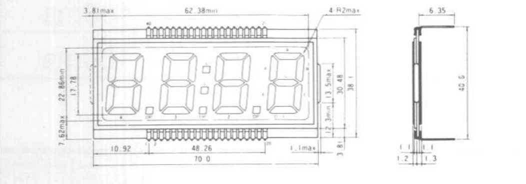

3.81max
86.23min
6.35
22.86min
17.78
7.62max
16.45
60.96
93.85
1.1max
12.3min
13.5max
30.48
38.1
3.81
40.6
1.2
1.3

6 Digits, Height of Characters 17.8 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	BP	21	DP	41	G4
2	E6	22	E1	42	L
3	D6	23	D1	43	B5
4	C6	24	C1	44	A5
5	DP	25	B1	45	F5
6	E5	26	A1	46	G5
7	D5	27	F1	47	B6
8	C5	28	G1	48	A6
9	DP	29	B2	49	F6
10	E4	30	A2	50	G6
11	D4	31	F2		
12	C4	32	G2		
13	DP	33	L		
14	E3	34	B3		
15	D3	35	A3		
16	C3	36	F3		
17	DP	37	G3		
18	E2	38	B4		
19	D2	39	A4		
20	C2	40	F4		

H1337C-C

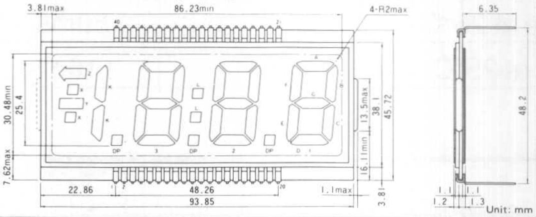

3.81max
62.38min
4-R2max
6.35
22.86min
17.78
7.62max
10.92
48.26
70.0
1.1max
12.3min
13.5max
30.48
38.1
3.81
40.6
1.2
1.3

4 Digits, Height of Characters 17.8 mm

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	NC	22	F1
3	NC	23	G1
4	NC	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	B4
15	C2	35	A4
16	DP1	36	F4
17	E1	37	G4
18	D1	38	NC
19	C1	39	NC
20	B1	40	BP

H1338C-C 3 1/2 Digits, Height of Characters 25.4 mm

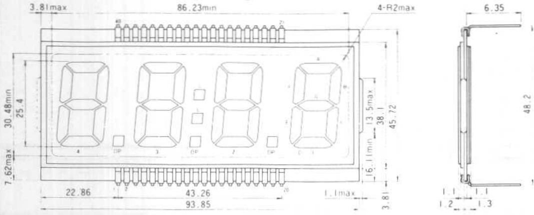

3.81max
86.23min
4-R2max
6.35
30.48min
25.4
7.62max
22.86
48.26
93.85
1.1max
16.11min
13.5max
38.1
45.72
3.81
48.2
1.2
1.3

Unit: mm

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	NC	24	B2
5	NC	25	A2
6	NC	26	F2
7	NC	27	G2
8	DP3	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP2	32	G3
13	E2	33	NC
14	D2	34	NC
15	C2	35	NC
16	DP1	36	NC
17	E1	37	NC
18	D1	38	Z
19	C1	39	X
20	B1	40	BP

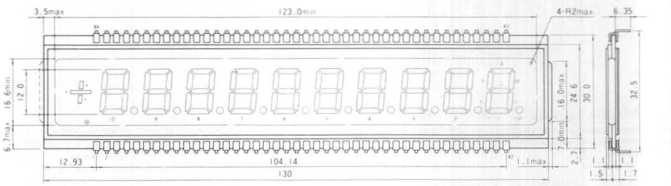
LS028C-C 4 Digits, Height of Characters 25.4 mm

Unit: mm


3.81max
86.23min
4-R2max
6.35
30.48min
25.4
7.62max
22.86
43.26
93.85
1.1max
16.11min
13.5max
38.1
45.72
3.81
48.2
1.2
1.3

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	NC	22	F1
3	NC	23	G1
4	NC	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP	28	L
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP	32	G3
13	E2	33	NC
14	D2	34	B4
15	C2	35	A4
16	DP	36	F4
17	E1	37	G4
18	D1	38	NC
19	C1	39	NC
20	B1	40	NC

LS029C-C 10 Digits, Height of Characters 12 mm

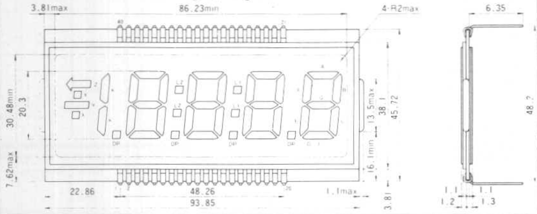

3.5max
123.0min
4-R2max
6.35
16.6min
12.0
6.7max
12.93
104.14
130
1.1max
16.0max
24.6
30.0
7.0min
2.7
32.5
1.1
1.5
1.7

Unit: mm

Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment	Pin No.	Segment
1	X	21	C6	41	C1	61	B5	81	B10
2	Y	22	DP6	42	DP1	62	A5	82	A10
3	E10	23	E5	43	BP	63	F5	83	F10
4	D10	24	D5	44	NC	64	G5	84	G10
5	C10	25	C5	45	B1	65	B6		
6	DP10	26	DP5	46	A1	66	A6		
7	E9	27	E4	47	F1	67	F6		
8	D9	28	D4	48	G1	68	G6		
9	C9	29	C4	49	B2	69	B7		
10	DP9	30	DP4	50	A2	70	A7		
11	E8	31	E3	51	F2	71	F7		
12	D8	32	D3	52	G2	72	G7		
13	C8	33	C3	53	B3	73	B8		
14	DP8	34	DP3	54	A3	74	A8		
15	E7	35	E2	55	F3	75	F8		
16	D7	36	D2	56	G3	76	G8		
17	C7	37	C2	57	B4	77	B9		
18	DP7	38	DP2	58	A4	78	A9		
19	E6	39	E1	59	F4	79	F9		
20	D6	40	D1	60	G4	80	G9		

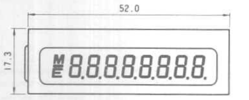
H1339C-C 4 1/2 Digits, Height of Characters 20.3 mm

Unit: mm

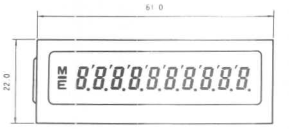

3.81max
86.23min
4-R2max
6.35
30.48min
20.3
7.62max
22.86
48.26
93.85
1.1max
16.1min
13.5max
38.1
45.72
3.81
48.2
1.2
1.3

Pin No.	Segment	Pin No.	Segment
1	BP	21	A1
2	Y	22	F1
3	K	23	G1
4	DP4	24	B2
5	E4	25	A2
6	D4	26	F2
7	C4	27	G2
8	DP	28	L1
9	E3	29	B3
10	D3	30	A3
11	C3	31	F3
12	DP3	32	G3
13	E2	33	L2
14	D2	34	B4
15	C2	35	A4
16	DP2	36	F4
17	E1	37	G4
18	D1	38	Z
19	C1	39	X
20	B1	40	BP

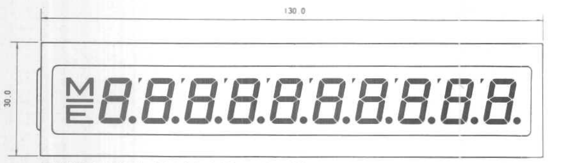
LCDs WITH TRIPLEX DRIVE


52.0
17.3
8.8.8.8.8.8.8.8.

H 1258C, 8 Digits, Height of Characters 6 mm


61.0
22.0
8.8.8.8.8.8.8.8.8.8.

H 2674, 10 Digits, Height of Characters 6 mm


130.0
30.0
8.8.8.8.8.8.8.8.8.8.8.8.8.

Pinout for
H 1258C
H2674AND
H 2739
on request.

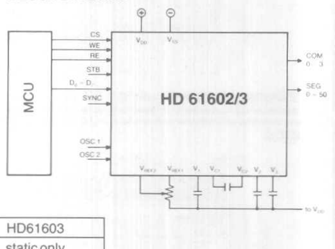
H 2739, 10 Digits, Height of Characters 12 mm

HD61602/3 – CMOS LCD DRIVER

FEATURES

- Two operation modes: Static drive only or static and dynamic drive
- Two supply voltage modes: 3V or 5V
- Low current consumption
  30μA typ. for 3V operation
  50μA typ. for 5V operation
- Built-in power supply for LCD driver
- 8 bit data interface
- 51 segment outputs (64 segment outputs max.)

BLOCK DIAGRAM


MCU
CS
WE
RE
STB
$D_0 - D_7$
SYNC
OSC 1
OSC 2
V_{DD}
V_{SS}
HD 61602/3
COM 0 - 3
SEG 0 - 50
V_{REF2}
V_{REF1}
V_1
V_{C1}
V_{C2}
V_2
V_3
to V_{DD}

Segment outputs			HD61602	HD61603
			static and dynamic	static only
			51	64
D	Static		51	--
A	1/2 Bias	1/2 Duty	102	--
T	1/3 Bias	1/3 Duty	153	--
A	1/3 Bias	1/3 Duty	204	--

80 Pin Flat Pack

HD6301/03

8-Bit CMOS MPU

HD6301

- 8-Bit CMOS Microcomputer System for LCD Module Application.
- Single-Chip Version

The HD6301V0 is an 8-bit CMOS single-chip microcomputer unit, Object Code compatible with the HD6801. 4kB ROM, 128 bytes RAM, Serial Communication Interface (SCI), parallel I/O terminals as well as three functions of timer on chip are incorporated in the HD6301V0. It is bus compatible with HMCS6800, provided with some additional functions such as an improved execution time of key instruction plus several new instructions of operation to increase system throughput. The HD6301V0 can be expanded up to 65k words. Like the HMCS6800 family, I/O level is TTL compatible with +5.0V single power supply. By using the Hitachi's 3μm CMOS process, low power consumption is realized. And as lower power dissipation mode, HD6301V0 has Sleep Mode and Stand-By Mode. So flexible low power consumption application is possible.

FEATURES

- Object Code Upward Compatible with HD6801 Family
- Abundant On-Chip Functions Compatible with HD6801V0;
  4kB-ROM, 128 Bytes RAM, 29 Parallel I/O Lines, 2 Lines of Data Strobe, 16-bit Timer, Serial Communication Interface.
- Low Power Consumption Mode: Sleep Mode, Standby Mode
- Minimum Instruction Cycle Time
  1μs (f=1MHz), 0.67μs (f=1.5MHz), 0.5μs (f=2MHz)
- Bit Manipulation, Bit Test Instruction
- Protection from System Burst: Address Trap, Op-Code Trap
- Up to 65k Words Address Space
- Wide Operation Range
  V_{CC} = 3 to 6V (f=0.5MHz), f=0.1 to 1.5MHz
  (V_{CC} = 5V ±10%), f = 0.1 to 2.0MHz (V_{CC} = 5V ±5%)

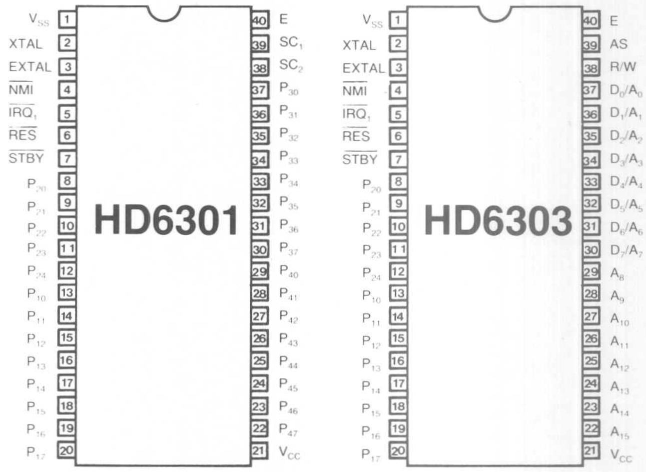
HD6303

- 8-Bit CMOS Microcomputer System for LCD Module Application. Instruction Set compatible with HD6301.
- Multi-Chip Version

FEATURES

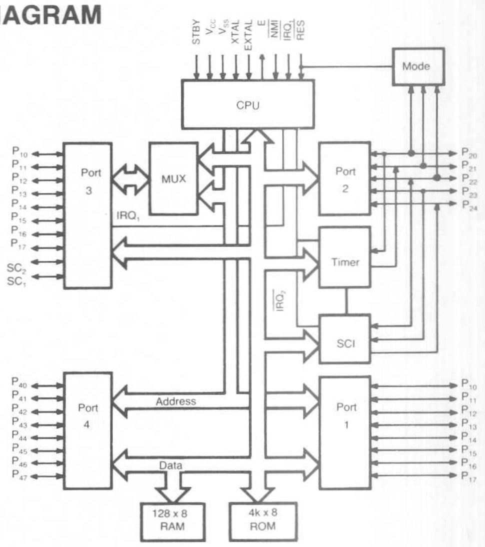
- Object Code Upward Compatible with the HD6800, HD6802, HD6801
- Multiplexed Bus ($D_0 \approx D_7/A_0 \approx A_7$)
- Abundant On-Chip Functions Compatible with the HD6301V0: 128Bytes RAM, 13 Parallel I/O Lines (including Timer, SCI I/O Terminals), 16-bit Timer, Serial Communication Interface (SCI)
- Low Power Consumption Mode: Sleep Mode, Stand-By Mode
- Minimum Instruction Cycle Time
  1μs (f=1MHz), 0.67μs (f=1.5MHz), 0.5μs (f=2.0MHz)
- Bit Manipulation, Bit Test Instruction
- Error Detecting Function: Address Trap, Op-Code Trap
- Up to 65k Words Address Space

PIN ARRANGEMENT



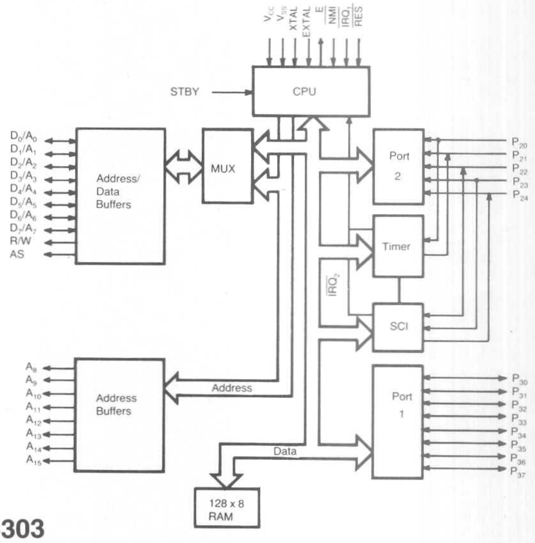
HD6301
V_SS 1
XTAL 2
EXTAL 3
NMI 4
IRQ_1 5
RES 6
STBY 7
P_20 8
P_21 9
P_22 10
P_23 11
P_24 12
P_10 13
P_11 14
P_12 15
P_13 16
P_14 17
P_15 18
P_16 19
P_17 20
40 E
39 SC_1
38 SC_2
37 P_30
36 P_31
35 P_32
34 P_33
33 P_34
32 P_35
31 P_36
30 P_37
29 P_40
28 P_41
27 P_42
26 P_43
25 P_44
24 P_45
23 P_46
22 P_47
21 V_CC
HD6303
V_SS 1
XTAL 2
EXTAL 3
NMI 4
IRQ_1 5
RES 6
STBY 7
P_20 8
P_21 9
P_22 10
P_23 11
P_24 12
P_10 13
P_11 14
P_12 15
P_13 16
P_14 17
P_15 18
P_16 19
P_17 20
40 E
39 AS
38 R/W
37 D_0/A_0
36 D_1/A_1
35 D_2/A_2
34 D_3/A_3
33 D_4/A_4
32 D_5/A_5
31 D_6/A_6
30 D_7/A_7
29 A_8
28 A_9
27 A_10
26 A_11
25 A_12
24 A_13
23 A_14
22 A_15
21 V_CC

BLOCK DIAGRAM



STBY
V_CC
V_SS
XTAL
EXTAL
E
NMI
IRQ_1
RES
Mode
CPU
P_10 P_11 P_12 P_13 P_14 P_15 P_16 P_17
SC_2
SC_1
Port 3
MUX
IRQ_1
Port 2
P_20 P_21 P_22 P_23 P_24
Timer
IRQ_2
SCI
P_40 P_41 P_42 P_43 P_44 P_45 P_46 P_47
Port 4
Address
Data
Port 1
P_10 P_11 P_12 P_13 P_14 P_15 P_16 P_17
128 x 8 RAM
4k x 8 ROM

HD6301



V_CC
V_SS
XTAL
EXTAL
E
NMI
IRQ_1
RES
STBY
CPU
D_0/A_0 D_1/A_1 D_2/A_2 D_3/A_3 D_4/A_4 D_5/A_5 D_6/A_6 D_7/A_7
R/W
AS
Address/ Data Buffers
MUX
Port 2
P_20 P_21 P_22 P_23 P_24
Timer
IRQ_2
SCI
A_8 A_9 A_10 A_11 A_12 A_13 A_14 A_15
Address Buffers
Address
Port 1
P_30 P_31 P_32 P_33 P_34 P_35 P_36 P_37
Data
128 x 8 RAM

HD6303